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TECHNICAL SPECIFICATIONS

FOR

CLEAR LAKE
STORMWATER TREATMENT SYSTEM

LA PORTE, INDIANA

July 1998

Prepared For:

City of La Porte
Parks and Recreation Department
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CLEAR LAKE
ALUM STORMWATER SYSTEM

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SECTION 01010

SUMMARY OF WORK

1.1 LOCATION AND DESCRIPTION OF WORK

A. The Clear Lake Stormwater Treatment System consists of the construction of a concrete block building, one alum feed system, pump, control panel, PVC alum feed line, PRGS conduit with cable, one stormwater meter, a 2500-gallon FRP tank, and all other appurtenances and related work required to complete the alum treatment system.

B. The Work is located in the City of La Porte, Indiana. Work to be performed shall be in accordance with applicable City and State standards, and drawings and specifications prepared by Environmental Research & Design, Inc. Reference Section 01072, Reference Standards.

C. The summary of the Work described in this Section is an overall summary of the responsibilities of the CONTRACTOR and his relation to the OWNER. It does not supersede the specific requirements of the other Contract Documents.

1.2 LOCAL LABOR AND MATERIALS

A. Whenever possible, the CONTRACTOR, his subcontractor(s), material men, or others who employ labor, shall employ such labor locally.

B. The CONTRACTOR should purchase materials such as sand, cement, gravel, pipe, steel, lumber, etc., from local dealers wherever possible.

1.3 RIGHTS OF ACCESS

A. The CONTRACTOR agrees that representatives of the OWNER will have access to the work wherever it is in preparation or progress and that the CONTRACTOR will provide facilities for such access and inspection.

B. The CONTRACTOR agrees that any authorized representative of the OWNER shall have access to any books, documents, papers, and records of the CONTRACTOR which are pertinent to the project for the purpose of making audits, examinations, excerpts, and transcriptions thereof.

1.4 CONTRACTS

A. The Work shall be constructed under one prime contract.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR shall have responsibility for all Work required to successfully complete the project, including paving, traffic control, bypass pumping, dewatering as required, temporary services and maintaining accurate construction drawings.

B. CONTRACTOR shall obtain and pay for all costs associated with all required permits not provided by the OWNER.

C. CONTRACTOR shall lay out the lines and grades for the work with appropriate qualified personnel.

D. CONTRACTOR shall be solely responsible for all obligations prescribed as employer obligations under Chapter XVII of Title 29, Code of Federal Regulations, Part 1926; "Safety and Health Regulations for Construction".

E. CONTRACTOR shall be solely responsible for compliance with the OSHA Excavating Safety Standards (29 CFR, Part 1926.650 Subpart P).

1.6 CONTRACTOR'S USE OF PREMISES

A. CONTRACTOR'S use of the premises shall be confined to the limits of the existing easement unless otherwise shown on the Drawings.

B. CONTRACTOR shall:

1. Assume full responsibility for protection and safekeeping of products stored on or off premises.

2. Move stored products that interfere with the operations of OWNER.

3. Obtain and pay for all additional storage or work areas required for his operations.

4. Keep all working areas in a generally neat condition.

5. Dust shall be minimized by use of water and deliquescent salts.

6. Erosion shall be controlled such that soil particles from the site do not enter public waters or neighboring property.

7. Noise shall be minimized by use of properly constructed and maintained equipment provided with suitable mufflers, snubbers and other sources of attenuating devices.

8. Contact property owner and obtain permission prior to storing material on right-of-way.

1.7 RESTORATION

A. Restoration of streets shall commence immediately upon completion of the task which required asphalt removal and shall be completed within 7 calendar days.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

1.1 GENERAL

A. This Section includes all cutting and patching of all Work under construction, completed Work and existing facilities in order to accommodate the coordination of work, install other work, uncover work for access, inspection or testing, or similar purposes. "Demolition Work" is specified elsewhere. Execute all cutting and patching, including excavation, backfill and fitting required to:

1. Remove and replace defective Work or Work not conforming to requirements of the Contract Documents.

2. Remove samples of installed Work as required for testing.

3. Remove all construction required to provide for specified alternation or addition to existing Work.

4. Uncover Work to provide for the ENGINEER'S inspection of covered Work or inspection by regulatory agencies having jurisdiction.

5. Connect to completed Work that was not accomplished in the proper sequence.

6. Remove or relocate existing utilities and pipes which obstruct the Work to which connections must be made.

7. Make connections or alternations to existing or new facilities.

8. Removal and replacement of paving. Pavement must be saw cut.

B. Restore all existing Work to a state equal to that which it was in prior to cutting and restore new Work to the standards of these Specifications.

C. Submittals:

1. At OWNERS request submit written notice to ENGINEER, requesting consent to proceed with cutting, including:

a. Identification of Project.

b. Description of affected work of CONTRACTOR and work of others.

c. Necessity for cutting.

d. Effect on other work and on structural integrity of Project.

e. Description of proposed work. Designate:

(1). Scope of cutting and patching
(2). CONTRACTOR, Subcontractor or trade to execute Work.
(3). Products proposed to be used.
(4). Extent of refinishing.
(5). Schedule of operations.

f. Alternatives to cutting and patching, if any.

g. Designation of party responsible for cost of cutting and patching.

2. Should conditions of Work, or schedule, indicate change of materials or methods, submit written recommendation to ENGINEER, including:

a. Conditions indicating change.

b. Recommendations for alternative materials or methods.

c. Submittals as required for substitutions.

3. Submit written notice to ENGINEER, designating time Work will be uncovered, to provide for observation. Do not begin cutting or patching operations until authorized by the ENGINEER.

D. Provide shoring, bracing and support as required to maintain structural integrity of Project and project adjacent Work from damage during cutting and patching.

E. Conform to all applicable Specifications for application and installation of materials used for patching.

F. Obtain all required permits for the Work.

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

1.1 ABBREVIATIONS

Common abbreviations which may be found in the Specifications are:

PARAMETER	ABBREV.	PARAMETER	ABBREV.
Alternative Current	a-c	Hertz	Hz
Ante Meridiem	a.m.	Hour	hr
Ampere	A	Horsepower	hp
Average	avr		
		Inch	in.
Biochemical Oxygen Demand	BOD	Inch-Pound	in.-lb
Brake Horsepower	bhp	Inside Diameter	ID
British Thermal Unit	BTU		
		Kilovolt-ampere	kva
Centigrade	C	Kilowatt	kw
Company	Co.	Kilowatt-hour	kwh
Cubic Inch	cu in		
Cubic Foot	cu ft	Linear Foot	LF
Cubic Yard	cu yd	Liter	l
Cubic Feet per Minute	cfm		
Cubic Feet per Second	cfs	Maximum	max
		Mercury	Hg
Decibel	db	Milligram	mg
Degree Centigrade (or Celsius)	°C	Milligrams per Liter	mg/l
Degree Fahrenheit	°F	Milliliter	ml
Diameter	diam	Millimeter	mm
Direct Current	d-c	Million Gallons	MG
Dollars	$	Million Gallons per Day	mgd
		Minimum	min
Each	ea		
Efficiency	eff	Net Positive Suction Head	npsh
		Number	No.
Fahrenheit	F	National Pipe Threads	NPT
Feet	ft		
Feet per Hour	fph	Ounce	oz
Feet per Minute	fpm	Outside Diameter	OD
Feet per Second	fps		
Figure	Fig.	Parts per Million	ppm
Flange	flg	Plus or Minus	±
Foot-Pound	ft-lb	Post Meridiem	p.m.
		Pound	lb
Gallon	gal	Pounds per Square Foot	psf
Gallons per Minute	gpm	Pounds per Square Inch	psi
Gallons per Second	gps	Pounds per Square Inch Absolute	psia
Gram	g	Pounds per Square Inch Gage	psig

PARAMETER	ABBREV.	PARAMETER	ABBREV.
Revolutions per Minute	rpm	Standard	std
		Standard Cubic Feet per Minute	scfm
Second	sec		
Specific Gravity	sp gr	Total Dynamic Head	TDH
Square	sq	Totally-Enclosed-Fan-Cooled	tefc
Square Foot	sq ft		
Square Inch	sq in	Volt	V
Square Yard	sq yd		

1.2 ORGANIZATION ABBREVIATIONS

Abbreviations of organizations which may be used in these Specifications are:

AASHTO	American Association of State Highway and Transportation Officials
ACS	American Chemical Society
ACI	American Concrete Institute
AGMA	American Gear Manufacturers Association
AICHE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
AREA	American Railway Engineering Association
ASTM	American Society for Testing and Materials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ATT	American Telephone and Telegraph
AWWA	American Water Works Association
AWS	American Welding Society
CRSI	Concrete Reinforcing Steel Institute
DIPRA	Ductile Iron Pipe Research Association
EPA	Environmental Protection Agency
FM	Factory Mutual
HEW	Department of Health, Education and Welfare

HUD	Department of Housing and Urban Development
IDOT	Indiana Department of Transportation
IEEE	Institute of Electrical and Electronic Engineers
IRI	Industrial Risk Insurance
ISO	Insurance Services Office
NAAMM	National Association of Architectural Metal Manufacturers
NARUC	National Association of Railroad and Utilities Commissioners
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCI	Precast Concrete Institute
SMACNA	Sheet Metal and Air Conditioning National Association
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.
USGS	United States Geological Survey
USPHS	United States Public Health Service
WWEMA	Water and Wastewater Equipment Manufacturers Association
WPCF	Water Pollution Control Federation

1.3 LEGEND

Legends of symbols used are shown on the Drawings, and in general, use of symbols in confined to the Drawings.

END OF SECTION

SECTION 01072

REFERENCE STANDARDS

1.1 GENERAL

A. When a reference standard is specified, comply with requirements and recommendations stated in that standard, except when they are modified by the Contract Documents, or when applicable laws, ordinances, rules, regulations or codes establish stricter standards. The latest provisions of applicable standards shall apply to the Work, unless otherwise specified. Reference standards include, but are not necessarily limited to, the following:

1. American Association of State Highway and Transportation Officials.
2. American Concrete Institute.
3. American Institute of Steel Construction.
4. American Iron and Steel Institute.
5. American National Standards Institute.
6. American Society of Mechanical Engineers.
7. American Society for Testing and Materials.
8. American Water Works Association.
9. American Welding Society.
10. Concrete Reinforcing Steel Institute.
11. Factory Mutual Association.
12. Indiana Department of Transportation Standard Specification for Road and Bridge Construction.
13. National Fire Protection Association.
14. City of La Porte Specifications.
15. Prestressed Concrete Institute.
16. Underwriters' Laboratories, Inc.
17. All other applicable standards listed in the Specifications, and the standards of utility service companies, where applicable.

END OF SECTION

SECTION 01341

SHOP DRAWING PROCEDURES

1.1 GENERAL

A. Shop Drawing procedures shall conform to requirements of General Conditions and as described in this Section.

1.2 PROCEDURE

A. Submit Shop Drawing to: Environmental Research & Design, Inc.
3419 Trentwood Blvd., Suite 102
Orlando, FL 32812
ATTN: Jeffrey L. Herr, P.E.
Phone: (407) 855-9465

B. The CONTRACTOR is to maintain an accurate updated submittal log. This log shall be brought to each scheduled progress meeting with the OWNER and the DESIGN ENGINEER. This log shall contain as a minimum, submittal description and assigned number, date to DESIGN ENGINEER, date returned to CONTRACTOR by DESIGN ENGINEER and status of submittal (approved/resubmit/rejected).

C. A letter of transmittal shall accompany each submittal. If data for more than one Section of the Specifications is submitted, a separate transmittal letter shall accompany the data submitted for each Section.

D. At the beginning of each letter of transmittal provide a reference heading indicating the following:

1. OWNER'S Name _____
2. Project Name _____
3. Contract No. _____
4. Transmittal No. _____
5. Section No. _____

E. If a Shop Drawing deviates from the requirements of the Contract Documents, CONTRACTOR shall specifically note each variation in his letter of transmittal.

F. All Shop Drawings submitted for approval shall have a title block with complete identifying information satisfactory to DESIGN ENGINEER.

G. All Shop Drawings submitted shall bear the stamp of approval and signature of CONTRACTOR as evidence that they have been reviewed by CONTRACTOR. Submittals without this stamp of approval will not be reviewed by DESIGN ENGINEER and will be returned to CONTRACTOR. CONTRACTOR'S stamp shall contain the following minimum information:

Project Name: _____

Contractor's Name: _____

Date: _____

Item: _____

Specifications: _____

Section: _____

Page Number: _____

Paragraph Number: _____

Drawing Number: _____

Location: _____

Submittal Number: _____

Approved By: _____

H. A number shall be assigned to each submittal by CONTRACTOR starting with No. 1 and thence numbered consecutively. Resubmittals shall be identified by the original submittal number followed by the suffix "A" for the first resubmittal, the suffix "B" for the second resubmittal, etc.

I. CONTRACTOR shall initially submit to DESIGN ENGINEER a minimum of 5 copies of all submittals.

J. After DESIGN ENGINEER completes his reviewed, Shop Drawings will be marked with one of the following notations:

1. No Exceptions Taken
2. Make Corrections Noted
3. Amend and Resubmit
4. Rejects - See Remarks

K. If a submittal is acceptable, it will be marked "No Exceptions Taken" or "Make Corrections Noted". Four prints or copies of the submittal will be returned to CONTRACTOR.

L. Upon return of a submittal marked "No Exceptions Taken" or "Make Corrections Noted", CONTRACTOR may order, ship or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.

M. If a Shop Drawing marked "Make Corrections Noted" has extensive corrections or corrections affecting other drawings or Work, DESIGN ENGINEER may require that CONTRACTOR make the corrections indicated thereon and resubmit the Shop Drawings for record purposes. Such drawings will have the notation, "Approved as Corrected - Resubmit."

N. If a submittal is unacceptable, 2 copies will be returned to CONTRACTOR with one of the following notations:

1. "Amend and Resubmit"

2. "Rejected - See Remarks"

O. Upon return of submittal marked "Amend and Resubmit", CONTRACTOR shall make the corrections indicated and repeat the initial approved procedure. The "Rejected - See Remarks" notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, CONTRACTOR shall repeat the initial approved procedure utilizing acceptable material or equipment.

P. Any related Work performed or equipment installed without an "No Exceptions Taken" or "Make Corrections Noted" Shop Drawing will be at the sole responsibility of the CONTRACTOR.

Q. Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for the time required to make delivery of material or equipment after data covering such is approved. CONTRACTOR shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawing. Materials or equipment will not be included in periodic progress payments until approval thereof has been obtained in the specified manner.

R. DESIGN ENGINEER will review and process all submittals promptly (not to exceed 14 days), but a reasonable time should be allowed for this, for the Shop Drawings being revised and resubmitted , and for time required to return the approved Shop Drawings to CONTRACTOR.

S. It is CONTRACTOR'S responsibility to review submittals made by his suppliers and Subcontractors before transmitting them to DESIGN ENGINEER to assure proper coordination of the Work and to determine that each submittals is in accordance with his desires and that there is sufficient information about materials and equipment for DESIGN ENGINEER to determine compliance with the Contractor Documents. Incomplete or inadequate submittals will be returned for revision without review.

END OF SECTION

SECTION 01545

PROTECTION OF THE WORK AND PROPERTY

1.1 GENERAL

A. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage as specified in the General Conditions and herein.

B. In order to prevent damage, injury or loss, CONTRACTOR'S actions shall include, but not be limited to, the following:

1. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with the progress of the Work or the Work of any other contractor or utility service company.

2. Provide suitable storage facilities for all materials which are subject to injury by exposure to weather, theft, breakage, or otherwise.

3. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.

4. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the Work shall present a safe, orderly and workmanlike appearance.

5. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other hazardous areas.

C. CONTRACTOR shall not, except after written consent from proper parties, enter or occupy with men, tools,materials or equipment, public or privately-owned land except on easements provided herein.

D. CONTRACTOR shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by the CONTRACTOR, it shall be restored by the CONTRACTOR, at his expense, to a condition equal to that existing before the damage was done.

1.2 BARRICADES AND WARNING SIGNALS

A. Where Work is performed on or adjacent to any roadway, right-of-way, or public place, CONTRACTOR shall furnish and erect barricades, fences, lights, warning signs, and danger signals, shall provide watchmen, and shall take other precautionary measures for protection of persons or property and the Work. Barricades shall be painted to be visible at night. From sunset to sunrise, the CONTRACTOR shall furnish and maintain at least one light at each barricade. Barricades shall be erected to keep vehicles from being driven on or into work under construction. CONTRACTOR shall furnish watchmen in sufficient numbers to protect the Work. The CONTRACTOR'S responsibility for the maintenance of barricades, signs, lights and for providing watchmen shall continue until the Project is accepted by OWNER.

1.3 TREE AND PLANT PROTECTION

A. CONTRACTOR shall protect existing trees, shrubs and plants on or adjacent to the site that are shown or designated to remain in place against unnecessary cutting, breaking or skinning of branches, bark or roots. All trees and shrubs shall remain in place unless otherwise noted on the Contract Documents or removal is approved by the Resident Project Representative.

B. Materials or equipment shall not be stored or parked within the drip line.

C. Temporary fences or barricades shall be installed to protect trees and plants in areas subject to traffic.

D. Within the limits of the Work, water trees and plants that are to remain, in order to maintain their health during construction operations.

E. Cover all exposed roots with burlap that shall be kept continuously wet. Cover all exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, run-off or noxious materials in solution.

F. If branches or trunk are damaged, prune branches immediately and protect the cut or damaged areas with emulsified asphalt compounded specifically for horticultural use in a manner approved by the ENGINEER.

G. All damaged trees and plants that die or suffer permanent injury shall be removed when ordered by the ENGINEER and replaced by a specimen of equal or better quality.

1.4 PROTECTION OF EXISTING STRUCTURES

A. Underground Structures:

1. Underground structures are defined to include, but not be limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical conduits, tunnels and other existing subsurface work located within or adjacent to the Construction limits.

2. All underground structures known to the ENGINEER are shown on the Drawings. This information is shown for the assistance of CONTRACTOR in accordance with the best information available, but is not guaranteed to be correct or complete.

3. CONTRACTOR shall call I.P.P.S. and others as necessary for location of all utilities. Contact utilities 48-hours prior to start of work, in accordance with Florida Statutes.

4. CONTRACTOR shall explore ahead of his trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption to the services which such structures provide. If CONTRACTOR damages an underground structure, he shall restore it to original condition at his expense.

5. Necessary changes in the location of the Work may be made by ENGINEER, to avoid unanticipated underground structures.

B. Surface Structures:

1. Surface structures are defined as all existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

C. Protection of Underground and Surface Structures:

1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the work of sustaining and supporting such structure, CONTRACTOR shall satisfy the ENGINEER that the methods and procedures to be used have been approved by the party owning same.

2. CONTRACTOR shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits to the Work. CONTRACTOR shall be responsible for all damage and expense for direct or indirect injury caused by his Work to any structure. CONTRACTOR shall repair immediately all damage caused by his work, to the satisfaction of the owner of the damaged structure.

3. It is understood and agreed that the CONTRACTOR has considered in his bid all of the permanent and temporary utility appurtenances shown or otherwise indicated on the Drawings and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him due to any interference from said utilities or the operation of moving them either by the utility company or by the CONTRACTOR.

D. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables, signs, poles, markers, and curbs which are temporarily removed to facilitate installation of the Work shall be replaced and restored to their original condition at CONTRACTOR'S expense.

1.5 PROTECTION OF INSTALLED PRODUCTS AND LANDSCAPING

A. Provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of Work.

B. Control traffic to prevent damage to equipment, materials and surfaces.

C. Prohibit traffic of any kind across planted lawn and landscaped areas.

D. Street signs, other signs, etc. removed during the course of construction shall be suitably stored in a safe manner to protect the item. Notation shall be made on the field set of plans of the location and type of item removed to allow for its replacement at the completion of all work in the area.

END OF SECTION

SECTION 01560

ENVIRONMENTAL CONTROLS

1.1 GENERAL

A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and adjacent areas. Remove physical evidence of temporary facilities at completion of Work.

1.2 NOISE CONTROL

A. CONTRACTOR'S vehicles and equipment shall be such as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA standards and in no case will noise levels be permitted which interfere with the work of the OWNER or others.

B. Noise shall be minimized by use of properly constructed and maintained equipment provided with suitable mufflers, snubbers and other sources of attenuating devices.

C. In general, no work shall be done between the hours of 5:00 p.m. and 7:00 a.m., or on Saturdays or Sundays unless specified otherwise. If prosecution of the work requires operations during the night the written permission of the ENGINEER shall be obtained before starting work.

1.3 DUST CONTROL

A. CONTRACTOR shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatever. CONTRACTOR shall apply water and calcium chloride or use other methods subject to the ENGINEER'S approval which will keep dust in the air to a minimum.

1.4 WATER CONTROL

A. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.

1. Control fill, grading and ditching to direct water away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff courses so as to prevent any erosion, damage or nuisance.

2. CONTRACTOR shall use a sediment box on all dewatering operations. The outfall of all drainage structures shall have sediment curtains installed.

B. Provide, operate and maintain equipment and facilities of adequate size to control surface water.

C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and in conformance with all environmental requirements.

1.5 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids.

C. Take special measures to prevent harmful substances from entering public waters.

1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants.

1. Prevent toxic concentrations of chemicals

2. Prevent harmful dispersal of pollutants into the atmosphere.

E. All CONTRACTOR'S equipment used during construction shall conform to all current federal, state and local laws and regulations.

1.6 EROSION CONTROL

A. Plan and execute construction methods to control surface drainage from work areas and disposal areas, to prevent erosion and sedimentation.

1. Hold the areas of bare soil exposed at one time to a minimum.

2. Provide temporary control measures such as berms, dikes and drains.

B. The CONTRACTOR shall comply with all applicable requirements of any soil and erosion and sediment control ordinances in force.

C. Hay bales, mulch, sedimentation basins sediment box and/or other temporary sedimentation controls, including silt fences and staked turbidity barriers, shall be used as necessary to control erosion and sedimentation.

D. Where pumps are used to remove highly turbid waters from construction areas, the water shall be treated by one or more of the following methods prior to discharge into public waters: pumping into grassed swales or appropriate vegetated areas, sediment basins or siltation curtains. At the preconstruction meeting the CONTRACTOR shall present his proposed plans and methods of controlling erosion.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

1.1 SCOPE OF WORK

CONTRACTOR is responsible for furnishing and installing the material and equipment as required by the Contract Documents. Proper approval of submittals and substitutions are required. Furnished material and equipment shall be properly transported, handled, stored and protected in accordance with manufacturer's instructions; federal, state or local regulations; or as approved by ENGINEER.

A. MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK:

1. Shall not be defective.

2. Shall comply with size, make, type and quality as specified in the Contract Documents, or as specifically approved in writing by ENGINEER.

3. Shall not be used for any purpose other than that for which it is designed or specified.

B. MANUFACTURED AND FABRICATED PRODUCTS:

1. Design, fabricate and assemble in accordance with the best engineering and shop practices.

2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

3. Two or more items of the same kind shall be identical, supplied by the same manufacturer.

4. Products shall be suitable for service conditions.

5. Equipment capacities, sizes and dimensions shown or as specified shall be adhered to unless variations are specifically approved in writing.

C. APPROVAL OF MATERIALS:

1. Only new materials and equipment shall be incorporated in the Work unless otherwise specified in the Contract Documents or approved by ENGINEER. All materials and equipment furnished by CONTRACTOR shall be subject to the inspection and approval of ENGINEER. No material shall be delivered to the Work without prior written approval of ENGINEER.

2. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by CONTRACTOR. If required by the Contract Documents or as requested by ENGINEER, either prior to beginning or during the progress of the Work, CONTRACTOR shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the approved specifications. Such samples shall be furnished, in accordance with the General Conditions. Except as otherwise noted, ENGINEER will make arrangements for and pay for the tests.

3. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, CONTRACTOR shall provide such samples of workmanship or finish as may be required.

4. The materials and equipment used on the Work shall correspond to the approved samples or other data.

1.2 IMPLEMENTATION

A. MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION:

1. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five copies to ENGINEER.

   a. Maintain one set of complete instructions at the job site during installation and until completion.

2. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

   a. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with ENGINEER for further instruction.

   b. Do not proceed with work without clear instructions.

   c. Do not omit any preparatory step or installation procedure unless specifically approved by ENGINEER.

B. TRANSPORTATION AND HANDLING:

1. Arrange deliveries of products in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site.

   a. Deliver products in undamaged condition in manufacturer's original containers or packaging, with identifying labels intact and legible.

b. Immediately, upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

2. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

C. STORAGE AND PROTECTION:

1. CONTRACTOR shall furnish a covered, weather-protected storage structure providing a clean, dry, noncorrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage and maintenance of stored equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants or moisture protection in equipment, etc. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project.

   Equipment and materials not properly stored will not be included in application for payment.

2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

   a. Store products subject to damage by the elements in weather-tight enclosures.

   b. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

   c. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration or discoloration with impervious sheet covering; provide adequate ventilation to avoid condensation.

   d. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

3. All materials and equipment to be incorporated in the Work shall be handled and stored by CONTRACTOR before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

4. Cementitious and other products sensitive to moisture damage shall be stored under a roof, off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel, and reinforcing steel shall be stored off the ground to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete beams shall be handled and stored in a manner to prevent staining, chipping or cracking or accumulations of dirt and standing water. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling, to a minimum.

5. All materials which, in the opinion of ENGINEER, have become so damaged as to be unfit for the use intended shall be promptly removed from the site of the Work, and CONTRACTOR shall receive no compensation for the damaged materials, its removal or its replacement.

6. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

7. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.

8. CONTRACTOR shall be responsible for all material, equipment and supplies sold and delivered to OWNER under this Contract until final inspection of the Work and acceptance by the ENGINEER. In the event any such material, equipment and supplies are lost, stolen, or become defective prior to final inspection and acceptance, CONTRACTOR shall replace same without additional cost to OWNER.

9. Should CONTRACTOR fail to take proper action on storage and handling of equipment supplied under this Contract within ten days after written notice to do so has been given, OWNER retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from CONTRACTOR'S next progress payment. These costs may be comprised of expenditures for labor equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary corrections.

D. SPECIAL TOOLS:

1. Manufacturers of equipment and machinery shall furnish any special tools (including grease guns or other lubricating devices) required for normal adjustment, operations and maintenance, together with instructions for their use. CONTRACTOR shall preserve and deliver to OWNER these tools and instructions in good order prior to OWNER'S acceptance of said equipment.

E. STORAGE AND HANDLING OF EQUIPMENT ON-SITE:

1. Special attention shall be given to the storage and handling of equipment on-site. As a minimum, the procedure outlined below shall be followed:

   a. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by ENGINEER, until such time as the equipment is to be installed.

   b. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.

   c. Manufacturer's storage instructions shall be carefully studied by CONTRACTOR and reviewed with ENGINEER. These instructions shall be carefully followed and a written record of this kept by CONTRACTOR.

   d. Moving parts shall be rotated (in accordance with the manufacturer's instructions) a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, CONTRACTOR shall start (run) the equipment (in accordance with the manufacturer's instructions), at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

   e. Lubricants shall be changed upon completion of installation and as frequently as required by the environmental conditions (dust, etc.) or manufacturer's instructions thereafter during the period between installation and acceptance. Mechanical equipment to be used in the Work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and start-up, at no extra cost to OWNER.

   f. Prior to acceptance of the equipment, CONTRACTOR shall have the manufacturer inspect the equipment and certify that its conditions has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall document that the equipment is in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at CONTRACTOR'S expense.

F. SPARE PARTS AND MAINTENANCE MATERIALS:

1. Spare parts and maintenance materials shall be supplied in accordance with the Contract Documents. CONTRACTOR shall collect and store all spare parts in an area to be designated by ENGINEER. In addition, CONTRACTOR shall furnish to ENGINEER an inventory listing all spare parts and maintenance materials, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivered cost.

G. GREASE, OIL AND FUEL:

1. All grease, oil and fuel required for testing and initial operation of equipment shall be furnished by CONTRACTOR.

2. CONTRACTOR shall be responsible for changing the oil in all (gear compartments) drives of mechanical equipment, after initial break-in of the equipment, which in no event shall be any longer than three weeks of operation.

END OF SECTION

SECTION 01620

STORAGE OF MATERIAL

1.1 GENERAL

A. Store and protect materials in accordance with manufacturer's recommendations and requirements of Specifications.

B. CONTRACTOR shall make all arrangements and provisions necessary for the storage of materials and equipment. All excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed so as not to injury any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, adjoining owners, tenants and occupants. Arrange storage in a manner to provide easy access for inspection.

C. Areas available on the construction site for storage of material and equipment shall be as shown or approved by the DESIGN ENGINEER and OWNER. Areas will be limited.

D. Materials and equipment which are to become the property of the OWNER shall be stored to facilitate their inspection and insure preservation of the quality and fitness of the Work, including proper protection against damage by freezing and moisture. They shall be placed inside storage areas unless otherwise acceptable to OWNER.

E. Lawns, grass plots or other private property shall not be used for storage purposes without written permission of the OWNER or other person in possession or control of such premises.

F. CONTRACTOR shall be fully responsible for loss or damage to stored materials and equipment

G. Do not open manufacturers containers until time of installation unless recommended by the manufacturer or otherwise specified.

1.2 MAINTENANCE OF STORAGE

A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:

1. State of storage facilities is adequate to provide required conditions.

2. Required environmental conditions are maintained on continuing basis.

3. Products exposed to elements are not adversely affected.

END OF SECTION

SECTION 01650

START-UP AND CHECK-OUT

1.1 SCOPE OF WORK

A. The work specified in this SECTION consists of start-up and final check-out of Mechanical, Electrical, Communications, Pneumatic, Hydraulic, Conveyance or Special Construction or any other discipline as called for by the technical specifications of the Contract Documents. These systems (heating, ventilating, air conditioning, plumbing, fire protection systems, HVAC and control systems, communications and alarm systems, lighting, power distribution, controls, and other electrical systems and elevators) and other operating equipment as required; will be demonstrated, to ENGINEER, to operate in the manner prescribed by the Contract Documents to ensure a complete operating systems, ready for OWNER'S use.

1.2 IMPLEMENTATION

A. PRELIMINARY REQUIREMENTS:

1. Start-up Certification: Prior to start-up of a system, successfully complete all the testing required of the individual components of the system. Submit five copies of DEMONSTRATION CERTIFICATION (attached to this section) signed by CONTRACTOR, subcontractor and the manufacturer's representative. All copies shall be provided with the respective copies of the Operation and Maintenance Manual. This form shall be completed and submitted before Instruction in Operation to ENGINEER or a request for final inspection.

2. Demonstrate to ENGINEER and DESIGN ENGINEER that all of the components of the system are operating under their own controls as designated.

3. Coordinate start-up activities with the OWNER'S operating personnel, the Manufacturers Representative and with ENGINEER prior to commencing start-up of a system.

B. START-UP:

1. Confirm that all equipment in a system is properly energized, prior to start-up.

2. Initiate start-up of each system in accordance with the Operation and Maintenance Manual.

3. Observe the system operation and make adjustments as necessary to optimize the system performance.

4. Coordinate with ENGINEER and DESIGN ENGINEER for any adjustments desired or operational problems requiring debugging.

5. Make adjustments as necessary.

6. Acceptability of each system's performance will be based on the system performing as specified, under actual operating conditions. The intent of the start-up is to demonstrate to ENGINEER that each system will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance.

7. Demonstrate the essential features of the systems as delineated elsewhere in the Contract Documents. Each system shall be successfully demonstrated only once, after completion of all required testing. The disciplines involved may include, but are not limited to:

   a. Mechanical

   b. Conveyance

   c. Electrical

   d. Communication

   e. Instrumentation & Controls

   f. Pneumatic

   g. Hydraulic

   h. Specialized Construction

C. CERTIFICATE OF COMPLETED START-UP DEMONSTRATION:

1. Submit five copies of Certificate of Completed Start-Up Demonstration memo signed by CONTRACTOR, Subcontractor and ENGINEER and insert one copy in each Operation and Maintenance Manual.

MANUFACTURER'S CHECK CERTIFICATION

CHECK-OUT MEMO NO.:_____

_____	OWNER:	_____	NO. COPIES: _____
_____	ENGINEER:	_____	NO. COPIES: _____
_____	DESIGN ENGINEER:	_____	NO. COPIES: _____
_____	CONTRACTOR:	_____	NO. COPIES: _____
_____	FIELD:	_____	NO. COPIES: _____
_____	OTHER:	_____	NO. COPIES: _____

PROJECT DATA		CONTRACT DATA	
NAME:	_____	NUMBER:	_____
LOCATION:	_____	DATE:	_____
CITY:	_____	DRAWING NO.:	_____
OTHER:	_____	SYSTEM DESCRIPTION:	_____

Name of equipment checked: _____

Name of manufacturer of equipment: _____

1. The equipment furnished by us has been checked on the job by us. We have reviewed (where applicable) the performance verification information submitted to us by CONTRACTOR.

2. The equipment is properly installed, except for items noted below.*

3. The equipment is operating satisfactorily, except for items noted below.*

4. The written operating and maintenance information (where applicable) has been presented to CONTRACTOR and has been reviewed with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to CONTRACTOR for insertion in each of the Equipment Brochures.

Checked By:

_____
Manufacturer's Representative

_____
_____
_____
Address/Phone # of Representative

_____
_____
Signature/Title - Person Making Check

_____
Date Checked

_____
Name of CONTRACTOR

_____
_____
_____
Authorized Signature/Title/Date

_____
Name of Subcontractor

_____
_____
_____
Authorized Signature/Title/Date

* Manufacturer's Representative Notations: Exceptions noted at time of check were:

_____

_____

_____

_____

Manufacturer's Representative to note adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate adequacy of related systems or equipment):

_____

_____

_____

DEMONSTRATION CERTIFICATION

CERTIFICATE OF START-UP DEMONSTRATION MEMO NO.:_____

_____	OWNER:	_____	NO. COPIES:	_____
_____	ENGINEER:	_____	NO. COPIES:	_____
_____	DESIGN ENGINEER:	_____	NO. COPIES:	_____
_____	CONTRACTOR:	_____	NO. COPIES:	_____
_____	FIELD:	_____	NO. COPIES:	_____
_____	OTHER:	_____	NO. COPIES:	_____

PROJECT DATA

NAME:	_____	NUMBER:	_____
LOCATION:	_____	DATE:	_____
CITY:	_____	DRAWING NO.:	_____
OTHER:	_____	SYSTEM DESCRIPTION:	_____

CONTRACT DATA

NOTE TO CONTRACTOR:

Submit five (5) copies of all information listed below for checking at least one week before scheduled start-up demonstration of the system. After all information has been approved by ENGINEER, give the OWNER a start-up demonstration as specified and have the OWNER sign five copies of this form. After this has been done, a written request for a final inspection of the system shall be made.

MEMORANDUM:

This memo is for the information of all concerned that the OWNER has been given a start-up demonstration on the system described above. This start-up demonstration consisted of the system operation, during which all major items of equipment were explained and demonstrated, and the following items were given to the OWNER:

(a) The OWNER'S copy of Operation and Maintenance Manual for the system containing approved submittal sheets on all items, including the following:

(1) Maintenance information published by manufacturer on equipment items.

(2) Printed warranties by manufacturers on equipment items.

(3) Performance verification information as recorded by CONTRACTOR.

(4) Check-out Memo on equipment by manufacturer's representative.

(5) Written operating instructions on any specialized items.

(6) Explanation of guarantees and warranties on the system.

(b) Prints showing actual "As-Built" conditions.

(c) A demonstration of the system in operation and of the maintenance procedures which will be required.

_____

(Name of CONTRACTOR)

By: _____

(Authorized Signature, Title and Date)

_____

(Name of Subcontractor)

By: _____

(Authorized Signature, Title and Date)

Operation and Maintenance Manual, Instruction Prints, Start-Up Demonstration and Instruction in Operation Received:

_____

(OWNER)

By: _____

(Authorized Signature, Title and Date)

END OF SECTION

SECTION 01710

CLEANING

1.1 GENERAL

A. Execute cleaning, during progress of the Work, at completion of the Work, and as required by General Conditions.

B. Requirements of Regulatory Agencies:

1. In addition to the requirements herein, maintain the cleanliness of the Work and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.

2. Comply with federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish. Clean up construction debris on a daily basis.

C. Scheduling of Cleaning and Disposal Operations:

1. So that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.

2. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work or on the premises surrounding the Work.

D. Waste Disposal:

1. Dispose of all waste materials, surplus materials, debris and rubbish off the project site.

2. Do not burn or bury rubbish and waste materials on the project site.

3. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

4. Do not discharge waste into streams or waterways.

E. Cleaning Materials:

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.

3. Use only materials which will not create hazards to health or property.

F. During Construction:

1. Keep the Work and surrounding premises within work limits free of accumulations of dirt, dust, waste materials, debris and rubbish. Clean up construction debris on a daily basis.

2. Keep dust generating areas wetted down.

3. Provide suitable containers for storage of litter, waste materials, debris and rubbish until time of disposal. Dispose of daily or as needed.

4. Dispose of waste, debris and rubbish off-site at legal disposal areas.

G. When Project is Completed:

1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.

2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.

3. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

4. Maintain cleaning until acceptance and occupation by Owner.

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

1.1 SCOPE OF WORK

A. Compile and submit product data and related information for maintenance and operation of all products furnished under Contract. Prepare and submit operating and maintenance data as specified in this SECTION.

B. Instruct City of La Porte personnel in maintenance of products and in operation of equipment and systems incorporated into the work.

1.2 IMPLEMENTATION

A. MANUAL: PREPARATION AND DESCRIPTION

1. Preparation of Data Shall be Done by Personnel:

a. Trained and experienced in maintenance and operation of described products.

b. Familiar with requirements of this SECTION.

c. Skilled as technical writer to the extent required to communicate essential data.

d. Skilled as draftsman competent to prepare required drawings.

2. Description:

a. Prepare data in the form of an instructional manual for use by City of La Porte personnel.

b. Format:

(1). Size: 8½ inches x 11 inches.

(2). Paper: 20 pound minimum, white, for typed pages.

(3). Text: Manufacturer's printed data, or neatly typewritten.

c. Drawings:

(1). Provide reinforced punched binder tab, bind in with text.

(2). Reduce larger drawings and fold to size of text pages, but do not use drawing prints larger than 14 inches x 17 inches.

d. Provide fly-leaf for each separate product, or each piece of operating equipment.

(1). Provide typed description of products and major component parts of equipment.

(2). Provide indexed tabs.

e. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

(1). Title of Project.

(2). Identity of separate structure as applicable.

(3). Identity of general subject matter covered in the manual.

3. Binders:

a. Commercial quality three-post binders with durable and cleanable plastic covers.

b. Maximum post height: 2 inches.

c. When multiple binders are used, correlate the data into related consistent groupings.

4. Content:

a. At a minimum, provide a neatly typewritten table of contents for each volume, arranged in systematic order.

(1). CONTRACTOR, name of responsible principal, address and telephone number.

(2). A list of each product required to be included, indexed to content of the volume.

(3). List, with each product, name, address and telephone number of:

(a). Subcontractor or installer.

(b). A list of each product required to be included, indexed to content of volume.

(c). Identify area of responsibility of each.

(d). Local source of supply for parts and replacements.

b. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

c. Product Data:

(1). Include only those sheets which are pertinent to the specific product.

(2). Annotate each sheet to:

(a). Clearly identify specific product or part installed.

(b). Clearly identify data applicable to installation.

(c). Delete references to inapplicable information.

d. Supplemental Product Data: as necessary to clearly illustrate:

(1). Relations of component parts of equipment and systems.

(2). Control and flow diagrams.

e. Written text, as required to supplement product data for the particular installation.

(1). Organize in consistent format under separate headings for different procedures.

(2). Provide logical sequence of instructions of each procedure.

f. Coordinate drawings with information in Record Documents to assure correct illustration of completed installation.

g. Do not use Record Documents as maintenance drawings.

h. Copy of each warranty, bond and service contract issued.

i. Provide information sheet for City of La Porte personnel:

(1). Proper procedures in event of failure.

(2). Instances which might affect validity of warranties or bonds.

B. MANUAL FOR MATERIALS AND FINISHES

1. Submit six copies of complete manual in final form.

2. Content: for architectural products, applied materials and finishes.

   a. Manufacturer's data, giving full information on products.

      (1). Catalog number, size, composition.

      (2). Color and texture designations.

      (3). Information required for reordering special manufactured products.

   b. Instructions for care and maintenance.

      (1). Manufacturer's recommendation for types of cleaning agents and methods.

      (2). Cautions against cleaning agents and methods which are detrimental to product.

      (3). Recommended schedule for cleaning and maintenance.

3. Content: for moisture protection and weather-exposed products.

   a. Manufacturer's data, giving full information on products.

      (1). Applicable standards.

      (2). Chemical composition.

      (3). Details of installation.

   b. Instructions for inspection, maintenance and repair.

4. Additional Requirements for Maintenance Data: As requested by the ENGINEER.

C. MANUAL FOR EQUIPMENT AND SYSTEMS

1. Submit six copies of complete manual in final form.

2. Content, for each unit of equipment and system, as appropriate:

   a. Description of unit and component parts.

      (1). Function, normal operating characteristics, and limiting conditions.

      (2). Performance curves, engineering data and tests.

      (3). Complete nomenclature and commercial number of replaceable parts.

b. Operating Procedures:

(1). Start-up, break-in, routine and normal operating instruction.

(2). Regulation, control, stopping, shut-down and emergency instructions.

(3). Summer and winter operating instructions.

(4). Special operating instructions.

c. Maintenance Procedures:

(1). Routine operations.

(2). Guide to "trouble-shooting".

(3). Disassembly, repair and reassembly.

(4). Alignment, adjusting and checking.

d. Servicing and lubrication required.

e. Manufacturer's printed operating and maintenance instructions.

f. Description of sequence of operation by control manufacturer.

g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

(1). Predicted life of parts subject to wear.

(2). Items recommended to be stocked as spare parts.

h. As installed control diagrams by controls manufacturer.

i. Each subcontractor's coordination diagrams.

j. Charts of valve tag numbers, with location and function of each valve.

k. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

l. Certificate of Demonstration.

3. Content, for each electric and electronic system, as appropriate:

a. Description of system and component parts:

(1). Function, normal operating characteristics, and limiting conditions.

(2). Performance curves, engineering data and tests.

(3). Complete nomenclature and commercial number of replaceable parts.

b. Circuit directories of panelboards:

(1). Electrical service

(2). Controls

(3). Communications

c. As installed color coded wiring diagrams.

d. Operating Procedures:

(1). Routine and normal operating instructions.

(2). Sequences required.

(3). Special operating instructions.

e. Maintenance Procedures:

(1). Routine operations.

(2). Guide to "trouble-shooting".

(3). Disassembly, repair and reassembly.

(4). Adjustment and checking.

f. Manufacturer's printed operating and maintenance instructions.

g. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

h. Other data as required under pertinent sections of specifications.

4. Prepare and include additional data when the need for such data become apparent during instruction of OWNER'S personnel.

D. SUBMITTAL SCHEDULE

1. Submit two copies of completed data in final form no later than 30 days following the ENGINEER'S review of the last shop drawing and/or other submittal specified under SECTION 01340.

a. One copy will be returned with comments to be incorporated into final copies.

2. Submit six (6) copies of approved manual in final form to the ENGINEER within 30 days after the reviewed copy is received.

3. Append six (6) copies of addendum to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection and start-up testing.

E. INSTRUCTION OF OWNER'S PERSONNEL

1. Prior to final inspection or acceptance, the manufacturer's representative shall fully instruct OWNER'S designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

2. Operating and maintenance manual shall constitute the basis of instruction.
   a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

1.1 SCOPE OF WORK

CONTRACTOR'S responsibility shall be to:

1. Compile warranties and bonds, as required in the Contract Documents and as specified herein.

2. Co-execute submittals when requested by ENGINEER.

3. Review submittals to verify compliance with Contract Documents.

4. Submit Warranties and Bonds to ENGINEER for review and transmittal to the CITY.

1.2 IMPLEMENTATION

A. SUBMITTAL REQUIREMENTS

1. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

2. Quantity: Two original signed copies are required.

3. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

   a. Product of work item.

   b. Firm, with name of principal, address and telephone number.

   c. Scope.

   d. Date of beginning of warranty, bond or service and maintenance contract.

   e. Duration of warranty, bond or service maintenance contract.

   f. CONTRACTOR, name of responsible principal, address and telephone number.

B. FORMAT OF SUBMITTALS

Prepare in duplicate packets:

1. Paper: Size 8½ inches x 11 inches, punch sheets for standard three-post binder.

   a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title WARRANTIES AND BONDS. List:

   a. Title of Project.

   b. Name of CONTRACTOR.

3. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

C. WARRANTIES AND BONDS

1. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with CONTRACTOR'S for one (1) year, unless otherwise specified, commencing at the time of final acceptance by the ENGINEER of each Phase. Durations of systems' (i.e., moisture protection, conveyance, etc.) warranties shall be as specified elsewhere in the Contract Documents.

2. CONTRACTOR shall be responsible for obtaining certificate for equipment warranty for all major equipment provided which has at least 1 hp motor or which lists for more than $1,000. ENGINEER reserves the right to request warranties for equipment not classified as major. CONTRACTOR shall still warrant equipment not considered to be "major" in CONTRACTOR'S one-year warranty period even though certificates of warranty may not be required.

3. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of CITY'S final acceptance of each Phase, CONTRACTOR shall obtain from the manufacturer a two-year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the manufacturer shall not relieve CONTRACTOR of the one-year warranty.

4. CONTRACTOR shall be responsible for all costs of repairs of work which becomes defective during construction and the following warranty period.

5. Warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of any or all equipment and components furnished by the manufacturer.

END OF SECTION

SECTION 02100

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SCOPE OF WORK: Completely remove and dispose of all existing structures and buildings including foundations, utilities and septic tanks; timber and brush, except where otherwise indicated; stumps and roots; existing pavement; and all debris in all areas where work on excavations, embankments, pavements and structures (including pipe culverts and other pipe lines) is to be done as shown or reasonably implied in the Drawings. Trees, plants, underbrush, and ground cover shall be protected and left standing where so designated on the Drawings or where directed by the Engineer.

1.02 PAYMENT: Not a separate pay item. Include in building cost.

PART 2 - MATERIALS

Not Applicable

PART 3 - EXECUTION

3.01 DEPTH OF REMOVAL: Contractor shall remove clearing & grubbing items referenced in 1.01 above if they are located two (2) feet below top of proposed subgrade (pavement areas) or two (2) feet below finished grade elsewhere. It is not the intent of this specification to have all material removed from this 2-foot depth but rather only those specific materials referenced in 1.01 above.

3.02 DEWATERING: Prevent surface water and subsurface or groundwater from entering excavations from ponding on prepared subgrades, existing bottoms, and surrounding areas. Use proper dewatering methods.

3.03 DISPOSAL OF WASTE MATERIALS: Except where stipulated that the Owner will retain particular waste materials, all such materials referenced in 1.01 above shall be the property of Contractor. Contractor shall dispose of all waste materials in accordance with all applicable regulations.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 **SCOPE OF WORK:** Excavate, fill, compact and grade all embankments, subgrades, shoulders, ditches and side slopes in accordance with the alignment, grades and cross-sections shown or reasonably implied in the Drawings. Work shall include furnishing fill (borrow) materials and hauling of unsuitable materials as required. Specifically excluded is all earthwork associated with underground utility installations (See Section 02250).

1.02 **PAYMENT:** Not a separate pay item. Include in building cost.

PART 2 - MATERIALS

2.01 **SUITABLE MATERIAL:** Fill or backfill material obtained from the construction efforts and borrow areas, must consist of clean sand or sand/clay having less than 5% organic content and less than 10% fines passing the #200 sieve.

2.02 **UNSUITABLE MATERIAL:** Muck, stumps, clay, roots, rock, vegetable matter, Rubbish, or other material which is located within pavement or any embankment areas, that will not compact into an enduring foundation.

PART 3 - EXECUTION

3.01 **REMOVAL OF UNSUITABLE MATERIALS:** Excavate and replace all unsuitable materials to obtain an enduring foundation.

3.02 **REMOVAL OF EXISTING PAVEMENTS:** Where a new pavement is to be constructed over an old one, the old pavement shall be scarified or plowed and broken up full width unless otherwise shown in the Drawings. If the Drawings provide that paving materials may be incorporated into the fill, such material shall be distributed in a manner to insure that voids are not created.

3.03 **DISPOSAL OF SURPLUS & UNSUITABLE MATERIAL:** Ownership of all suitable materials shall remain with the Owner until the final job requirements for fill or backfill materials have been fulfilled. Unless otherwise provided, any surplus materials then remaining and not needed for job requirements shall become the property of Contractor and are to be disposed of by him. Where temporary storage of apparent excess suitable materials within the project site may be impracticable, Contractor may stockpile the materials outside the project site in equally suitable material, at his own expense.

Excavated muck or other materials unsuitable for construction shall be disposed of as shown in the Drawings or, if the Drawings do not indicate the method of disposal, the materials shall become the property of Contractor and shall be disposed of by him off the project site.

3.04 DISPOSAL OF PAVING MATERIALS: Unless otherwise indicated in the Drawings, paving materials excavated in the removal of existing pavements, such as asphalt, block, concrete slab, limerock, sidewalk, curb and gutter, etc., shall become the property of Contractor and shall be disposed of by him off the project site. Materials which remain the property of the Owner such as paving brick, shall be placed in neat piles as directed by the Owner.

3.05 BORROW: Should there be insufficient satisfactory material available from the excavation to meet the requirements for fill material, and where borrow sites are not provided in the Contract Documents, borrow sites and material shall be secured by Contractor at no additional expense to the Owner.

3.06 DISPOSAL AREAS: Where the plans or specifications require Contractor to dispose of excavated materials off the project site, and the disposal area is not indicated in the Contract Documents, Contractor shall furnish the disposal area without additional compensation.

3.07 EARTHWORK CONSTRUCTION: In advance of the placement of any fill, plow and/or scarify the surface to a depth of a least 6" until the surface is free from uneven features which would prevent uniform compaction by construction equipment. Additionally, prior to placing fill, Contractor shall proof-roll demucked and scarified surface by means of several overlapping passes of a heavy vibratory roller to detect areas of unsuitable or yielding soil. Proof-rolling shall achieve a minimum of 95% of maximum (AASHTO T-180 modified proctor) density. Place successive layers of fill not more than 8" in thickness, measured loose. Blade-mix each layer thoroughly and uniformly compact it continuously to an average density of 95% of maximum (AASHTO T-180) density. This density should also be removed for the top 1' for pavement areas and 2'0" below footings and foundations. Designated landscaped, non-traffic bearing areas shall be exempt from these proof-rolling and compaction requirements but shall receive minimum compaction to achieve a relatively unyielding surface condition. Desired density under such areas is 95% of maximum modified proctor density.

3.08 DEWATERING: Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.09 MAINTENANCE AND PROTECTION OF WORK: Maintain all earthwork construction throughout the life of the Contract and take all reasonable precautions as well as any precautions prescribed in Permits for this project to prevent loss of material from the site due to the action of wind or water. Except as otherwise provided, Contractor shall repair at his expense any slides, washouts, settlements, subsidence, or other mishap which may occur prior to final acceptance of work.

3.10 FINAL GRADE TOLERANCES: Shape the earthwork to conform to lines, grades and cross-sections shown in the Drawings with the following tolerances: all earth shoulders, slopes, and side ditches shall be completed and shaped to a surface which is within 0.1' of the true surface on the Drawings, except that adjacent to pavement, curb, or sidewalk the finish grade shall match the edge of pavement, curb or sidewalk. However, if sod is to be placed adjacent to pavement, curbs or sidewalks, final grading shall allow the top of sod soil mat to be flush with top edge of pavement, curb or sidewalk.

3.11 TESTING (BY OWNER):

Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gauges in accordance with ASTM D 3017.

If field tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.

END OF SECTION

SECTION 02250

EARTHWORK - UNDERGROUND UTILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK: The work consists of excavating and backfilling all trenches and pits required for the installation of all underground utilities, pipelines, culverts, appurtenant structures, and other items called for or reasonably implied in the Drawings to include sheeting and bracing, dewatering, supply and transport of fill materials, and disposal of waste materials. Appurtenant structures include manholes and other items related to underground systems.

1.02 PAYMENT: Not a separate pay item.

PART 2 - MATERIALS

2.01 BEDDING MATERIAL - CLASS I: ASTM D2321, except that sizing shall be ¼" to ¾". (Angular graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.)

2.02 BEDDING MATERIAL - CLASS II: ASTM D2321, except that upper size limit shall be ¾". (Coarse sands and gravels including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Unified Soil Classification System (USCS) soil types GW, GP, SW, and SP are included.)

2.03 BEDDING MATERIAL - CLASS III: ASTM D2321. (Fine sand and clay gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures, USCS soil types GM, GC, SM, and SC are included.)

2.04 INITIAL LIFT BACKFILL: Clean earth fill composed of sand, clay and sand, sand and rock, crushed rock, or approved combination. Under no circumstances shall any muck, stumps, roots, brush, trash, rubbish or organic material be used in the backfill. Material may be selected from the excavation, or obtained, if necessary, from an approved borrow pit area. The fragment size listed below shall not be exceeded for the following pipe materials:

PIPE MATERIAL	FRAGMENT SIZE (Greatest Dimension - Inches)
Concrete	3
Steel	3
Cast Iron	3
Ductile Iron	3
Corrugated Metal	3
Vitrified Clay	1½
Plastic	1
Asbestos Cement	½

2.05 **FINAL LIFT BACKFILL:** As described in 2.04, except that maximum dimension for any stone, or pavement fragment shall be 6".

2.06 **SHEETING AND BRACING:** Wood sheeting to be left in place shall be treated with preservatives.

PART 3 - EXECUTION

3.01 **GENERAL:** Trenches shall be excavated to the alignment and elevations required to install utilities with proper foundations and bedding. Open no more trench in advance of pipe laying than is necessary to expedite the work.

3.02 **SHEETING AND BRACING:** To prevent damage to property, injury to persons, erosion, cave-ins, or excessive trench widths, or as required by law, adequate sheeting and bracing shall be provided. Sheeting shall be removed when the trench has been backfilled to at least one-half its depth, or when removal would not endanger the construction of adjacent structures. When required, to eliminate excessive trench width or other damage, sheeting, bracing or shoring shall be left in place and the top cut off at an elevation 2.5' below finished grade, unless otherwise specified. Wood sheeting shall not be removed from the trench region below the crown of the pipe.

3.03 **TRENCH WIDTH:** The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8" for unsheeted trench, or 12" for sheeted trench. Trench walls shall be maintained as vertical as possible to the top of the pipes; the maximum width of trench measured at the top of the pipe shall not exceed the outside pipe diameter plus 2', unless otherwise called for in the Drawings.

3.04 **UNSTABLE TRENCH/PIT BOTTOM:** Where muck or other deleterious materials are encountered at or below trench grade, they shall be removed and replaced with Bedding Material (2.01) in layers not to exceed 6" in thickness, compacted to at least 95% of maximum (AASHTO T-180) density. The Engineer may elect, depending upon the severity of the unstable soil, to require special foundations.

3.05 OVER-EXCAVATION: Should the trench be inadvertently over-excavated below a point 6" below the bottom of the pipe, but not beyond a point 12" below the bottom of the pipe, fill that area of over-excavation with Bedding Material (2.02) and compact to 95% of maximum (AASHTO T-180) density. Contractor shall fill any area of over-excavation beyond a point 12" below the bottom of the pipe with Class I Bedding Material to form an impervious mat at his expense. Where the Engineer approves alternate material, compaction shall be not less than 95% of maximum (AASHTO T-180) density.

3.06 NON-CUSHIONED TRENCH BOTTOM: Where pipe is to be laid in a rock-cut or other non-cushioned material, excavation shall allow for 6" of bedding beneath the pipe.

3.07 EXCAVATED MATERIALS: Ownership of all suitable excavated materials shall remain with the Owner until the final job requirement for fill or backfill materials have been fulfilled. Unless otherwise provided, any surplus materials then remaining and not needed for job requirements shall become the property of Contractor and are to be disposed of by him. Excavated material to be used for backfill shall be neatly and safely deposited at the sides of the trench/pit where space is available. All excavated material shall be stockpiled in a manner that will not endanger the work. Hydrants under pressure, water and gas valves, manhole covers, fire and police call boxes, or other utility controls shall be left unobstructed and accessible. Gutters shall be kept open or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed. Unless otherwise approved, stockpiles shall not obstruct adjacent streets, walks or driveways. Where temporary storage of apparent excess suitable materials within the work area may be impracticable, Contractor may stockpile the materials in areas provided by him until such materials are needed in the job or are declared surplus. With the written approval of the Engineer, Contractor may dispose of such apparent excess material with the stipulation that he shall replace any portion of the disposed material required to fulfill the actual job requirements, with equally suitable material, at his own expense.

3.08 DEWATERING: All utilities and structures shall be laid/placed, "in the dry". Dewatering shall be by well-point unless otherwise approved by the Engineer. Dewatering shall be in accordance with good standard practice and all applicable codes and regulations and must be efficient enough to lower the water level in advance of the excavation and maintain the trench or pit bottom and sides continuously firm and dry through inspection. Discharge from dewatering shall not interfere with the normal drainage of the area in which the work is being performed, create a public nuisance or form ponding.

3.09 BEDDING: All pipe shall be bedded Class B except where Class A is called for by the Engineer. Bedding shall be in accordance with the Standard Detail Drawings and as described herein.

Class B - Raise trench to above pipe grade by placement and compaction of 4-6" of the bedding material specified for the particular system of installation. Provide bell holes to allow continuous support along the pipe barrel. Place and compact additional bedding material in 6" maximum lifts compacted to 95% of maximum (AASHTO T-180) density to the spring line of the pipe. Where coarse materials with voids have been used for bedding, the same coarse material shall also be used for the zone up to the spring line. Avoid vertical and lateral displacement of the pipe from proper alignment.

Class A Concrete Cradle - The pipe shall be bedded in a monolithic cradle of plain or reinforced concrete having a thickness under the barrel of at least 4" or ¼ of the inside diameter of the pipe, whichever is greater, and extending up the sides to a height of at least ¼ of the pipe outside diameter. The cradle shall have a width at least equal to the outside diameter of the pipe plus 8" or 1¼ of the outside diameter of the pipe, whichever is greater. Provide temporary supports consisting of preshaped wood blocks or bricks with wood wedges. When necessary, rigidly anchor or weight the pipe to prevent flotation when the concrete is placed. Place concrete uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than 5' from its point of deposit. Concrete placed beneath the pipe shall be sufficiently workable so that the entire space beneath the pipe can be filled without excessive vibration.

Class A Concrete Arch - The pipe shall be bedded in bedding material. The bedding shall have a minimum thickness beneath the pipe of 4" or ¼ of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. The top half of the pipe shall be covered with a monolithic plain or reinforced concrete arch having a thickness at the pipe crown of at least 4" or ¼ of the inside diameter of the pipe, whichever is greater, and a minimum width equal to the outside diameter of the pipe plus 8" or 1¼ of the diameter of the pipe, whichever is greater.

3.10 BACKFILL-INITIAL LIFT: Initial Lift Backfill Material (2.04) shall be carefully placed and tamped over the upper half of the utility, and shall be carefully continued in layers not exceeding 6" in thickness for the full trench width, until the fill is 12" above the utility. Available material from the excavation shall be used if approved. The "Initial Lift" shall be thoroughly compacted and completed before the "Final Lift" is placed. Compact to 95% of maximum (AASHTO T-180) density.

3.11 BACKFILL-FINAL LIFT: The remainder of the trench shall be backfilled with Final Lift Backfill material (2.05), in layers not exceeding 12". When trenches are cut in pavements or areas to be paved, compaction shall equal 98% of maximum (ASSHTO T-180) density. Otherwise compact to 95%.

3.12 BORROW: Should there be insufficient satisfactory material from the excavation to meet the requirements for fill material, and where borrow sites are not provided in the Contract Documents, borrow sites shall be secured by Contractor.

3.13 COMPACTION METHOD: The above specified compaction shall be accomplished using accepted standard methods (powered tampers, vibrators, etc.), with the exception that the first two feet of backfilling over the pipe shall be compacted by manual tamping devices. Flooding or puddling with water to consolidate backfill is not acceptable, except where sand is encountered.

3.14 MATERIAL DISPOSAL: Excess, unsuitable, or cleared and grubbed material, resulting from the utility installation, shall be immediately removed from the work site and disposed of. Excess excavated material shall be spread on the disposal site and graded in a manner to drain properly and not disturb existing drainage conditions. Where disposal areas are not provided in the Contract Documents, Contractor shall furnish the disposal area without additional compensation.

3.15 TESTING: Owner to provide density testing by a qualified independent laboratory at intervals not to exceed 50' for each lift.

END OF SECTION

SECTION 02282

TERMITE CONTROL

PART 1 - GENERAL

1.01 **SUMMARY:** This Section includes soil treatment for termite control.

1.02 **SUBMITTALS:**

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections:

1. Product data and application instructions.

2. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.03 **QUALITY ASSURANCE**

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

C. Use only termiticides that bear a Federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.04 **JOB CONDITIONS**

A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.05 **WARRANTY**

A. Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

B. Warranty Period: 5 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of following chemical elements.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

Chloropyrifos:	Dursban TC, Dow Chemical Co.
Permathrin:	Dragnet T, FMC Corp. Torpedo, ICI Americas, Inc.
Cypermethrine:	Prevail FT, MC Corp. Demon, ICI Americas, Inc.
Fenvalerate:	Gold Cost Tribute, DuPont
Isofenphose:	Pryfon, Mobay Corp.

C. Dilute with water to concentration level recommended by manufacturer.

D. Other solutions may be used as recommended by Applicator if approved for intended application by authorities having jurisdiction. Use only soil treatment solutions which are not harmful to plants.

PART 3 - EXECUTION

3.01 APPLICATION

A. Surface Preparation: Remove foreign matter which could decrease treatment effectiveness on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs, if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:

a. Apply 4 gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls,,pipes and electric. conduit penetrating slab, and around interior column footers.

b. Apply one gallon of chemical solution per 10 square feet as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

c. Apply 4 gallons of chemical solution per 10 linear feet of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches wide along outside of foundation to a depth of not less than 12 inches. Punch holes to top of footing at not more than 12 inches o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.

2. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gals, per 10 linear feet of penetration.

C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION

SECTION 02480

GRASSING

PART 1 - GENERAL

1.01 SCOPE OF WORK: The work consists of the establishment of a stand of grass on slopes, shoulders and those areas disturbed by the construction effort as shown or reasonably implied in the Drawings. Work shall include ground preparation, fertilization, application of lime, grass installation by seeding and mulching or sodding and watering and maintaining.

1.02 PAYMENT: Square yards.

PART 2 - MATERIALS

2.01 SOD: As directed by Owner. Locally available.

2.02 FERTILIZER AND LIMESTONE: Fertilizer chemical designation shall be 8-8-8.

2.03 WATER: Water other than City water shall have the prior approval of the Engineer.

PART 3 - EXECUTION

3.01 GENERAL: Grassing shall be incorporated into the work at the earliest possible time as required to provide slope stabilization.

3.02 SEQUENCE OF OPERATIONS: The work shall proceed in the following sequence: preparation and fertilization; sodding; rolling; watering and maintaining.

3.03 FERTILIZATION AND LIMESTONE: Spread fertilizer with mechanical equipment at the uniform rate of 1000 lbs per acre and immediately mix with the soil to a depth of 4". On steep slopes (machine spreading not practicable) hand spreading and mixing to a depth of 2" will be acceptable. Limestone shall be added as required to establish proper pH conditions for the grassing work.

3.04 SODDING: Place sod on the prepared and fertilized moist soil surface with edges in close contact. The setting of the pieces shall be staggered. Firmly and smoothly imbed by length, tamping with appropriate tools. Sod shall be watered as early as possible on the day of laying. The edges of the grassed area shall be straight with rows aligned to within six inches and with edges tamped to provide a feather edge effect. Where the sod may slide, due to height and slope, peg the sod with pegs driven through the sod blocks into firm earth at suitable intervals. Remove any pieces of sod which, after placing, show an appearance of extreme dryness. Open joints shall be fitted.

3.05 ROLLING: Thoroughly roll the entire area immediately after completion of the seeding or sodding.

3.06 **WATERING:** Water the grassed areas so as to provide optimum growth conditions for the establishment of the grass. Contractor shall coordinate the use of water with the appropriate utility company.

3.07 **MAINTENANCE:** Maintain the planted areas in a satisfactory condition until final acceptance of the project but in no case for less than two (2) weeks after the planting. Such maintenance shall include watering, mowing and filling, leveling and repairing of any washed or eroded areas, as may be necessary. Replant any areas in which the establishment of the grass stand is not developing satisfactorily.

END OF SECTION

SECTION 02570

PAVEMENT REMOVAL AND RESTORATION

PART 1 - GENERAL

1.01 **SCOPE OF WORK:** Remove, dispose, and restore existing pavement, curb, curb and gutter, sidewalks, driveways and valley gutters as required to construct other work items under this Contract. Such pavement, concrete, etc., shall be replaced and restored to a condition at least equal to its pre-construction state.

1.02 **PAYMENT:** Square yards.

PART 2 - MATERIALS

2.01 **GENERAL:** Materials used shall be in accordance with City of La Porte requirements.

PART 3 - EXECUTION

3.01 **GENERAL:** All materials shall be installed per City of La Porte requirements.

3.02 **PAVEMENT REMOVAL:** Existing pavement to be removed shall be mechanically saw cut prior to trench excavation, leaving a uniform and straight edge, with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimal. Remove sidewalk, driveways, curbs and gutters to existing joints or cut by sawing; however, every effort shall be made to tunnel under existing concrete curbs.

3.03 **TEMPORARY SURFACE:** Immediately following the specified backfill and compaction, a temporary sand seal coat surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration. Said surfacing shall remain for 10 days to assure the stability of the backfill under normal traffic conditions. Following this period and prior to 15 days after application, the temporary surfacing shall be removed and final roadway surface restoration accomplished. Immediately prior to final restoration, the temporary surfacing shall be removed and the existing pavement mechanically sawed straight and clean to the stipulated dimensions.

3.04 **RESTORATION:** Replace or repair, as specified herein, all existing sidewalks, driveways, curbs and gutters, removed or disturbed, or destroyed by construction. Restore all concrete cement driveways to 6" and sidewalks to 4" minimum thickness, unless otherwise shown in the Drawings.

3.05 **PAVEMENT BASE:** The base thickness and material (ie. limerock, soil cement, limerock cement, concrete) shall be as shown in the Drawings. The base shall extend 1' beyond the top of the trench width.

3.06 **PAVEMENT SURFACE:** Asphaltic concrete surface course shall be equal to the existing pavement thickness but in no case shall it be less than 1" in thickness. The replacement pavement shall also match the existing pavement in grade.

3.07 SETTLEMENT: Excessive settlement within the warranty period shall be repaired by Contractor as directed by the Engineer at no expense to the Owner.

3.08 TESTING: Testing shall be as provided under the particular sections of these Standard Specifications under which the restoration work is done.

END OF SECTION

SECTION 02580

CONCRETE CURBS, SIDEWALKS, AND DRIVEWAYS

PART 1 - GENERAL

1.01 **SCOPE OF WORK:** Furnish all labor and materials to construct concrete curbs and gutters, sidewalks including ramps, parking control islands, and driveways, as called for in the Drawings and detailed in the Standard Detail Drawings to include excavation and backfill; foundation; and forming, placing, jointing, form removing, finishing and curing concrete.

1.02 **PAYMENT:** Square yards.

PART 2 - MATERIALS

2.01 **GENERAL:** Materials used shall be in accordance with City of La Porte requirements.

PART 3 - EXECUTION

3.01 **FOUNDATION (SUBGRADE PREPARATION):** The subgrade shall be excavated or filled with suitable material to the required grades and lines. All soft, yielding, and otherwise unsuitable material shall be removed and replaced with suitable material. Filled sections shall be compacted to a minimum of 98% of maximum (AASHTO T-180) density and extend to a minimum of 1' outside the form lines. The subgrade shall be dense, firm, trimmed to a uniform smooth surface, and in a moist condition when the concrete is placed.

3.02 **MACHINE LAID CURB:** The slipform/extrusion machine approved shall be so designed as to place, spread, consolidate, screed, and finish the concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section. The machine shall shape, vibrate, and/or extrude the concrete for the full width and depth of the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible. All operations of mixing, delivery, and spreading concrete shall be so coordinated as to provide uniform progress, with stopping and starting of the machine held to a minimum.

3.03 **FORMING:** Depth of forms shall be equal to the Drawing dimensions for the concrete to be placed against them. Forms shall be staked to resist the pressure of the concrete without deviation from line and grade. They shall be cleaned each time used and shall be oiled or saturated with water prior to placing concrete.

3.04 **REINFORCEMENT:** Reinforcement shall only be required where called for in the Drawings. Set reinforcement for sidewalks and driveways above the foundation so concrete will flow under it.

3.05 **PLACING:** Place concrete in the forms and tamp and spade to prevent honeycomb until the top of the structure can be floated smooth. Round all edges to ½" radii unless otherwise shown on the Standard Detail Drawings.

3.06 **SIDEWALK RAMPS:** Ramps shall be provided at all road/street crossings each way as shown in the Standard Detail Drawings.

3.07 CONTRACTION JOINTS: Unless otherwise shown or noted in the Drawings, weakened plane contraction joints shall be located as follows:

Curbs: 10' maximum intervals

Driveways and Plazas: To form squares of uniform size with sides not exceeding 15 feet or rectangles of uniform size with side ratios not exceed 1½ to 1

Sidewalks: To form squares of uniform size

Contraction joints may be sawed, hand-formed, or made by 1/8" thick division plates in the formwork. Sawing shall be done early after the concrete has set to prevent the formation of uncontrolled cracking. The joints may be hand-formed by using a narrow or triangular jointing tool or a thin metal blade to impress a plane of weakness into the plastic concrete. Where division plates are used, the plates shall be removed after the concrete has set and while the forms are still in place.

3.08 EXPANSION (ISOLATION) JOINTS: Provide isolation joints between all distinct structures such as between sidewalk and curb, driveway and sidewalk or curb, sidewalk or curb and inlets, around concrete utility poles, and at radius points along the curb and at the end of a continuous pour.

3.09 FINISHING: Strike off concrete sidewalks and driveways by means of a wood or metal screed, used perpendicular to the forms, to obtain required grade and remove surplus water latence. Broom finish the surfaces and finish edged with an edging tool having a radius of ½".

Remove all curb and gutter forms within 24 hours after concrete is in place, and fill minor defects with mortar composed of one part Portland cement and two parts fine aggregate. Plastering is not permitted. Finish all curb and gutter surfaces while the cement is still green, to a brush finish. For any surface areas that are too rough or where surface defects made additional finishing necessary, the curb shall be rubbed to a smooth surface with a soft brick or wood block, with water used liberally.

3.10 SURFACE REQUIREMENTS: Test the gutters with a 20' straight edge laid parallel to the centerline of the roadway while the concrete is still plastic. Straight edging shall be done along the edge of the gutter adjacent to the pavement or along other lines on the gutter cross-section. Irregularities in excess of ¼" shall be corrected immediately. Surface variations on sidewalks and driveways shall not exceed ¼" under a 10' straight edge, nor more than 1/8" on a 5' traverse section.

3.11 CURING: Concrete shall be cured by the Membrane Curing Compound Method for a continuous period of 72 hours minimum, commencing after completing the finishing and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Immediately replace any curing material that may be removed or damaged during the 72 hour period.

This method requires the application of a clean membrane curing compound or white pigmented curing compound (2.04) by a hand sprayer in a single continuous film with uniform coverage of at least one gallon to each 200 square feet. Any cracks, check or other defects shall be recoated immediately. Agitate the curing compound thoroughly in the drum prior to application, and during application as necessary to prevent settlement of the pigment.

3.12 **BACKFILLING AND COMPACTION:** After the concrete has set sufficiently, but no later than 3 days after the pouring, the spaces in front and back of the curb and other excavation generated from this work shall be refilled to the required elevation with suitable material, placed and thoroughly compacted in layers not to exceed 6".

3.13 **PROTECTION:** The Contractor shall always have materials available to protect the surface of the plastic concrete against rain. These materials shall consist of waterproof paper or plastic sheeting. For slipform construction, materials such as wood plants or forms to protect the edges shall also be required.

3.14 **TESTING:** Provide not less than three 6" by 12" cylinder compressive strength tests (ASTM C39) and one slump test (ASTM C143) for each 75 cubic yards of part thereof poured.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work included in this section consists of providing all labor, materials and equipment necessary for providing and installing formwork for concrete.

B. Related Work Described Elsewhere:

1. Concrete Reinforcement: Section 03200

2. Cast-in-Place Concrete: Section 03300

1.02 QUALITY ASSURANCE

A. Qualifications: Formwork shall be constructed in accordance with the specified standards, as well as all pertinent codes and regulations. Where provisions of pertinent codes conflict with the requirements of this section of these specifications, the more stringent provisions shall govern.

B. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards:

1. Standard Building Code

2. ACI 347 "Recommended Practice for Concrete Formwork"

3. Local Codes and Regulations

C. Pre-placement Checklist: The Contractor, as part of his Quality Control Plan, shall develop and submit for approval a Pre-placement Checklist form to cover the following items:

1. Reference Drawings covering the placement for all trades and disciplines.

2. Date and time scheduled for placement and the actual date and time of placement.

3. Foreman name, placement number, number of truckloads and number of cylinders.

4. Checklist items such as embeds (list each), subgrade, rebar, forms, alignment, plumbness, etc.

5. Sign-offs for foreman, Contractor's Quality Control representative, each subcontractor foreman (major subs, mechanical, electrical, plumbing, etc.) and Construction Manager.

D. No concrete may be placed until the checklist is properly and completely signed off. Failure to comply with this provision can be grounds for rejecting the work. The checklist shall be weather protected and located with the foreman or at the foreman's station.

1.03 SUBMITTALS

A. Materials: Submit manufacturer's literature on form ties, spreaders, corner formers, form coatings and bond breakers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to one of the following, a combination thereof, or equivalent as approved by the Engineer.

1. Lumber: Douglas Fir-Larch No. 2 grade, seasoned, surfaced on four sides.

2. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association. (Minimum 3/4-inch thickness).

B. Form Ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole. Use embedded rods with integral waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will not be permitted.

C. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

D. Chamfer Strips: Chamfer strips shall be polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 3/4-inch chamfer (unless indicated otherwise) at exposed edges of concrete members.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure resulting from the placement and vibration of concrete and shall be sufficiently rigid to maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar, and shall be adequately braced against lateral, upward or downward movement.

B. Coating of Forms: Apply form coating to board forms prior to placing steel reinforcing. Keep form coatings off steel reinforcing, items to be embedded and previously placed concrete.

C. Form Erection:

1. Provide a means of holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects of the finished concrete. Insure that forms may be removed without injury to the surface of the finished concrete.

2. Provide a positive means of adjustment of shores and struts. Insure that all settlement is taken up during concrete placing.

3. Temporary openings shall be provided in wall forms to limit the free-fall of concrete to a maximum of 6 feet unless an elephant truck is used. Such openings shall be located to facilitate placing and consolidation and shall be spaced no more than 8 feet apart. Temporary openings shall also be provided in the bottom of wall and column forms and elsewhere as necessary to facilitate cleaning and observation immediately prior to placing.

4. Do not embed any form-tying device or part thereof other than metal in concrete.

5. Form surfaces of concrete members except where placement of the concrete against the ground is shown on the drawings. The dimensions of concrete members shown on the drawings apply to formed surfaces, except where otherwise indicated.

D. Removal of Forms:

1. Remove forms when concrete compressive strength, as determined by test cylinders, reaches specified 28-day compressive strength.

2. Do not remove forms from concrete which have been placed with outside air temperature below 50°F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

E. Formed Openings: Openings shall be of sufficient size to permit final alignment of the items within it without deflection or offsets of any kind and to allow space for packing where the items pass through the wall to ensure water tightness around openings so formed. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated and specified. Reinforcing steel shall be at least 2 inches clear from the opening.

F. Embedded Items: Set anchor bolts and other embedded items accurately and hold securely in position in the forms until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check all nailing, blocks, plugs and strips necessary for the attachment of trim, finish and similar work prior to concreting.

G. Pipes and Wall Spools Cast in Concrete:

1. Install wall spools, wall flanges and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools in the reinforcing steel.

2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will be possible during construction.

H. Form Tolerances:

1. Failure of the forms to produce the specified concrete surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no cost to the Owner.

2. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

	Maximum Tolerance
Sleeves and Inserts	± 1/3" to -1/4"
Projected Ends of Anchors	± 1/4" to -0.0"
Anchor Bolt Setting	± 1/4" to -1/4"
Finished Concrete, All Locations	± 1/4" to -1/4" in 10 ft of length

The plane or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and Inserts	Centerline of sleeve or insert
Projected Ends of Anchors	Plane perpendicular to the end of the anchor as located on the drawings.
Anchor Bolt Setting	Centerline of anchor bolt
Finish Concrete	The concrete surface as located on the drawings.

3. Where equipment is to be installed, comply with manufacturer's tolerances if more severe than above.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section consists of providing all labor, materials, equipment and incidentals required to install all steel bars, steel wire and wire fabric required for the reinforcement of concrete, as shown on the Drawings, and as specified herein.

B. Related Work Described Elsewhere:

1. Concrete Formwork: Section 03100
2. Cast-in-Place Concrete: Section 03300

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all material, workmanship and practices shall conform to the following standards:

1. Standard Building Code
2. ACI 315 "Details and Detailing of Concrete Reinforcement", latest edition
3. CRSI Manual of Standard Practices
4. Local codes and regulations

1.03 SUBMITTALS

A. Materials and Shop Drawings:

1. Submit mill test certificates identifying chemical and physical analyses for each load of reinforcing steel delivered, if requested by Engineer.
2. Submit reinforcing bending lists and placing drawings for all reinforcing. Placing drawings shall indicate all openings (mechanical, electrical, equipment), including additional reinforcing at openings and intersecting wall, beam and footing arrangements as indicated on the structural drawings and specified herein. Placing drawings shall be coordinated with the concrete placing schedule. Each bending list and placing drawing submitted shall be complete for each major element of a structure (grade slabs, footings, walls, floor or beams), including all dowels and other bars as required. Furnishing such lists shall not be construed that the list will be reviewed for accuracy. The contractor shall be wholly and completely responsible for the accuracy of the list and for furnishing and placing reinforcing steel in accordance with the details shown on the plans and as specified. Submit one (1) reproducible (Sepia) and two (2) Blue Line prints for each submittal.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reinforcement shall be shipped to the work with bars of the same size and shape fastened in bundles with metal identification tags giving size and mark securely wired on. The identification tags shall be labelled with the same designation as shown on the submitted bar lists and shop drawings.

B. All bars shall be stored off the ground and shall be protected from moisture and be kept free from dirt, oil or injurious contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete reinforcement in sizes No. 3 (3/8") and larger shall be deformed steel bars of the same sizes and shapes indicated on the Drawings. The steel shall be newly rolled stock of domestic manufacturer, substantially free from mill scale, rust, dirt, grease or other foreign matter. Bars shall be of intermediate grade, deformed billet steel conforming to ASTM Specification A615, Grade 60, including all supplementary requirements. Use ASTM A615, grade 40 where indicated on drawings.

B. Rail-steel bars will not be allowed in the work.

C. Reinforcement shall be accurately fabricated to the dimensions indicated on the Drawings. Particular care shall be exercised not to have stirrups oversized in order to maintain proper coverage of concrete. Stirrups and tie bars shall be made around a pin having a diameter not less than 2 times the maximum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than 5 times the minimum thickness of the bar except for bars larger than 1", in which case the bends shall be made around a pin of 8-bar diameters. All bars shall be bent cold. Bars reduced in section or with kinks or bends not shown on the Drawings will not be accepted.

D. Wire fabric shall conform to ASTM Specification A185 for Welded Steel Wire Fabric for Concrete Reinforcement. Use flat sheet of wire fabric (rolls not allowed).

E. Wire tie shall be 16-gauge minimum, zinc coated annealed.

F. Bar supports in beams and slabs exposed to view after stripping shall be galvanized or plastic coated. Use concrete supports for reinforcing in concrete placed on grade.

PART 3 - EXECUTION

3.01 INSTALLATION

A. No reinforcing bars shall be welded either during fabrication or erection without prior written approval from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work.

B. Unless otherwise shown on the Drawings, splices in reinforcement shall be lapped not less than 36 bar diameters. Splice all horizontal bars in circular structures with Class "C" tension splices. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.

C. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.

D. Reinforcement shall be accurately positioned as indicated on the Drawings, and secured against displacement by using zinc coated annealed iron wire ties of not less than 16-gauge, or suitable clips at intersections.

E. All accessories such as chairs, chair bars, and the like are an integral part of the reinforcement and shall be furnished and installed in sufficient quantity to satisfactorily position all steel, in accordance with the latest (ACI 315) Manual of Standard Practice for Detailing Reinforced Concrete Structures.

F. Except as otherwise indicated on the Drawings, bars in slabs, beams and girders shall be spliced as per requirements in ACI 315. Splices and laps in columns, piers and struts shall be sufficient to transfer full stress by bond. Splices in adjacent bars shall be staggered if required.

G. Except as otherwise indicated on the Drawings, reinforcement shall be installed with clearance for concrete coverage as follows (Refer to General Notes on structural drawings):

Footing Bottoms	3-inch
Formed surfaces in contact with soil, water, wastewater or exposed to the weather	2-inch
Columns, beams and walls	1-1½ inch
Slabs or grade	2-inch

H. All slab reinforcing shall be supported on concrete cubes or wafers of the correct height. Wafers shall contain soft steel wires embedded therein for fastening to reinforcing. Wafers shall have a minimum compressive strength of 3,500 psi and shall have been cured as specified for concrete. Masonry units will not be permitted for supporting steel in bottom mats or elsewhere. For supporting the top steel in slabs, the Contractor shall furnish extra steel supports, such as channels if required, and shall construct blocks of concrete having the same quality as specified for the structure for use in supporting both top and bottom mat steel. Wood blocks, stones, brick chips, etc., cinder blocks, or concrete building blocks will not be allowed. Alternative methods for supporting top steel in slabs, such as vertical reinforcing fastened to bottom and top mats, may be used if approved by the Engineer.

I. Alternate methods of supporting bottom reinforcement for slabs and beams not exposed to the weather (such as plastic chairs, but not plastic-tipped bolsters) may be used only if specifically approved by the Engineer.

J. Reinforcement for vertical surfaces (beams, columns, walls) shall be properly and firmly positioned from the forms at all points by means of stainless steel (tipped) bolsters or equal, subject to Engineer's approval.

K. Reinforcement which is to be exposed for a considerable length of time after being placed shall be painted with a heavy coat of neat cement slurry.

L. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcement has been checked by the Construction Manager and has permission given to proceed with the concreting. The Construction Manager shall be given a minimum of 24 hours notice of the availability of set reinforcement for checking.

M. Do not straighten or rebend reinforcing steel in a manner that will injure the material. Do not use bars with bends not shown on the Drawings.

N. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.

O. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.

P. Roll wire mesh used for reinforcement flat before placing concrete. Support and tie mesh to prevent movement during concrete placement. Extend fabric to within 2 inches of the edges of the slab and lap splices at least 1½ courses of the fabric and a minimum of 6 inches. Tie laps and splices securely at ends and at least every 24 inches with 16-gauge annealed steel wire. Pull the fabric into position as the concrete is placed by means of hooks, and work concrete under the steel to ensure that it is placed at the proper distance above the bottom of the slab.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of providing cast-in-place concrete.

B. Related Work Described Elsewhere:

1. Concrete Formwork: Section 03100

2. Concrete Reinforcement: Section 03200

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of the following standards:

1. Standard Building Code

2. Local Codes and Regulations

3. ACI 318-89, Building Code Requirements for Reinforced Concrete

B. Plant Qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready-Mixed Concrete Production Facilities of the National Ready-Mixed Concrete Association and ASTM C94.

C. Evaluation and Acceptance of Concrete: Evaluation and acceptance of concrete will be in accordance with ACI-318, Chapter 4, if requested by the Engineer.

1.03 SUBMITTALS

A. Materials and Shop Drawings: The following information shall be submitted for approval. No concrete shall be furnished until submittal has been approved.

1. Plant Qualification: Satisfactory evidence shall be submitted indicating compliance with the specified qualification requirements.

2. Materials: Satisfactory evidence shall be submitted indicating that materials to be used, including cement, aggregates and admixtures meet the specified requirements.

3. Cement:

   a. Cement for all concrete shall be domestic Portland cement that conforms to the requirements of ASTM Designation C-150 Type I, or Type II. Storm sewer manholes, wet wells, pumping stations and structures exposed to wastewater shall be constructed with Type II cement. Type I cement may be used for buildings if any.

   b. Only one (1) brand of cement shall be used in any individual structure unless approved by the Engineer. Cement which has become damaged, partially set, lumpy or caked shall not be used and the entire contents of the sack or container which contains such cement will be rejected. No salvaged or reclaimed cement shall be used.

4. Design Mix: The design mix to be used shall be prepared by qualified persons and submitted for approval. The design of the mix is the responsibility of the Contractor subject to the limitations of the Specifications. Approval of this submission will be required only as minimum requirements of the Specifications have been met. Such approval will in no way alter the responsibility of the Contractor to furnish concrete meeting the requirements of the Specifications relative to strength and slump.

5. Ready-Mix Concrete: Provide delivery tickets or weighmaster's certificate per ASTM C94, including weights of cement and each size aggregate, amount of water in the aggregate, and amount of water added at the plant. Write in the amount of water added on the job. No salvaged or reclaimed cement shall be used.

6. Fly ash shall not be allowed in any concrete mixture.

C. Aggregates:

   1. ASTM C33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No. 8.

D. Water: Clean and potable

E. Air Entraining Admixture: ASTM C260

F. Water Reducing and Retarding Admixture: ASTM C494, Type D. Admixture shall not contain calcium chloride.

G. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concresive 1001-LPL or approved equal.

H. Epoxy Resin Coating: Sikagard 62, as manufactured by Sika Corp. (1-800/330-2579).

PART 2 - PRODUCTS

2.01 MIXES

A. General Requirements:

1. Mix Design: Proportioning shall be on the basis of field experience and/or trial mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests and standard deviation shall be submitted. Proportioning for small structures may be by the water/cement ratio under special approval by the Engineer. Concrete mix design shall comply with the Standard Building Code Requirements.

2. Air Content: 5 percent ± 1 percent

3. Slump: 4 inches ± 1 inch

4. Water Cement Ratio: 0.58 maximum (non-air entrained)
   0.46 maximum (air entrained)

5. Minimum Compressive Strength at 28 days: 3,000 psi

B. Production of Concrete:

1. General: Concrete shall be ready-mixed and shall be batched, mixed and transported in accordance with ASTM C94, except as otherwise indicated.

2. Air Entraining Admixture: Air entraining admixtures shall be charged into the mixture as a solution and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water.

3. Water Reducing and Retarding Admixture: Water reducing and retarding admixture shall be added and measured as recommended by the manufacturer. The addition of the admixture shall be separate from the air entraining admixture. The addition of the admixture shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Admixtures shall be stored, handled and batched in accordance with the recommendations of ACI 318.

C. Delivery Tickets: In addition to the information required by ASTM C94, delivery tickets shall indicate the cement content and the water/cement ratio.

D. Temperatures: The temperature of the concrete upon delivery from the truck shall not exceed 90°F.

E. Modifications to the Mix: No modifications to the mix shall be made in the plant or on the job which will decrease the cement content or increase the water/cement ratio beyond that specified. No modifications of any kind shall be made except by a qualified and responsible representative of the concrete producer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Preparation Before Placing: No concrete shall be placed until the approval of the Engineer has been received. Approval will not be granted until forms are thoroughly clean and reinforcing and all other items required to be set in concrete have been placed and thoroughly secured. The Engineer shall be notified a minimum of 24 hours before concrete is placed.

B. Conveying:

1. General: Concrete shall be handled from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete. No concrete shall be placed more than 90 minutes after mixing has begun for that particular batch.

2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear opening equal to no less than one-third of the maximum interior horizontal area, or five times the maximum aggregate size being used. Side slopes shall be no less than 60 degrees. Controls on gates shall permit opening and closing during the discharge cycle.

3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing during the placing of concrete.

4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of concrete for more than 6 feet.

5. Chutes: Chutes shall be metal or metal lined, and shall have a slope not exceeding one vertical to two horizontal, and not less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used only if they discharge into a hopper before distribution.

6. Pumping Equipment: Pumping equipment and procedures, if used, shall conform to the recommendations contained in the report of ACI Committee 304 on "Placing Concrete by Pumping Methods", ACI 304.2R-71. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1½ inches.

7. Conveying Equipment Construction: Aluminum or aluminum alloy pipe for tremies or pump lines and chutes, except for short lengths at the truck mixer, shall not be permitted.

8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete operation.

3.02 APPLICATION

A. Placing:

1. General: Concrete shall be deposited continuously, or in layer of such thickness (not exceeding 2 feet in depth) that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness.

2. Supported Elements: At least two hours shall elapse after depositing concrete in columns or walls before depositing in beams, girders, or slabs supported thereon.

3. Segregation: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to procedures which will cause segregation.

B. Consolidating Concrete:

1. General: Concrete shall be consolidated by means of internal vibrators operated by competent workmen.

2. Vibrators: Vibrators shall have a minimum head diameter of at least 2 inches, a minimum centrifugal force of 700 pounds and a minimum frequency of 8,000 vibrations per second.

3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be supplemented by others having a minimum head diameter of 1½ inches, a minimum centrifugal force of 300 pounds and a minimum frequency of 9,000 vibrations per second.

4. Space Vibrator: One space vibrator for each three in sue shall be kept on the site during all concrete placing operations.

5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. The duration of each insertion shall be from 5 to 15 seconds. Concrete shall not be transported in the forms by means of vibrators.

C. Epoxy Coating of Floor Slab: Apply to all floor slabs, if and where indicated.

1. Surface Preparation:

a. Substrate must be clean and sound. It may be dry or damp, but free of standing water and frost. Remove dust, laitance, grease, curing compounds, waxes, impregnations, foreign particles, coatings, and disintegrated material from the surface by mechanical means (i.e., sandblasting, high-pressure waterblasting, etc.) as approved by the Engineer.

b. Cracks in the substrate and other repairs required to achieve a level surface in the area of the overlay work must be treated as directed by the Engineer.

c. Extend all existing control and expansion joints through the overlay. Install new joints as directed by the Engineer. Fill all joints as directed by the Engineer.

d. Any porous substrate must be tested for moisture vapor transmission prior to the application of an epoxy resin adhesive. Should the test indicate the presence of moisture vapor transmission, consult the Engineer before starting the application.

2. Application:

a. Mixing the epoxy resin adhesive binder:

(1) To minimize color differences, blend two complete Component B's together. Use only one of the blended Component B's to mix with a Component A. After the first Component B has been used, blend the second Component B with a new Component B and repeat the above procedure for the entire application.

(2) Premix each component. Proportion equal parts by volume of Component A and Component B into a clean, dry mixing pail. Mix thoroughly for 3 minutes minimum with a jiffy paddle on a low-speed (400-600 rpm) drill. Mix only that quantity of material that can be used within its pot life (25-40 minutes at 73°F).

b. Placement Procedure: Prime the prepared substrate with the mixed epoxy resin adhesive binder with brushes, rollers, or brooms. Do not over-prime or puddle. Coverage should be 300 square feet/gallon minimum. Use Broadcast System. Do not apply to surfaces during moisture vapor transmission period.

c. Apply the epoxy resin adhesive with a 3/16 inch x 3/16 inch notched squeegee while the primer is still tacky. Allow the binder to self-level, and then slowly broadcast an oven-dried sand in such a manner that the sand drops vertically into the binder. Broadcast lightly, making several passes, allowing the binder to bleed through the sand before the next pass. Cover completely with sand before the binder becomes tack-free. Estimate oven-dried sand quantity required to broadcast to excess at 2 pounds/square foot. Remove excess aggregate when the broadcast overlay has reached sufficient cure as to not be damaged.

d. Seal coat the surface with the epoxy resin adhesive using a roller. Do not apply the seal coat too heavy as to loosen the slip resistant surface texture. Coverage will typically be 160 square feet/gallon. When applying seal coat, never stop the application until the entire surface has been sealed, if possible. If impossible, always discontinue at an edge, corner or joint. Never let a previously coated film dry, always seal coat into a wet film. Always apply the seal coat at a 45° angle to an edge, corner or joint.

e. Adhere to all limitations and cautions for the epoxy resin adhesive binder in the manufacturer's current printed literature.

D. Protection: Rainwater shall not be allowed to increase the mixing water, nor to damage the surface finish. Concrete shall be protected from construction overloads. Design loads shall not be applied until the specified strength has been attained.

3.03 TESTING

A. A testing laboratory employed by the Owner will make such tests required.

B. Standard laboratory compressive test cylinders will be obtained by the laboratory when concrete is discharged at the point of placing (i.e., discharge end of pumping equipment), and cylinders will be made and cured in accordance with the requirements of ASTM Designation C31. A set of six (6) cylinders will be obtained for each 50 cubic yards, or fraction thereof, placed each day, for each type of concrete. The cylinders will be cured under laboratory conditions and will be tested in two groups of two (2) at 7 and 28 days of age, with 2 held until released by the Engineer in accordance with the requirements of ASTM Designation C39.

C. The laboratory will conduct tests of concrete as it is discharged from the mixer at the point of placing. Slump tests will be made for each truckload of concrete. Slump tests may be made on any batch, and failure to meet specific slump requirements will be sufficient cause for rejection of the batch. If water is added after initial test, then the "load" shall be retested.

D. Air content of the concrete mixture will be tested on every other truck in accordance with AASHTO T199.

E. Historical strength/break data may be submitted with mix design and may be used in the approval process provided the mix design is otherwise acceptable. If the mix design requires modifications, a test batch may still be required.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Concrete unit masonry
2. Reinforced unit masonry
3. Masonry waste disposal

1.02 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 29 days.

B. For concrete unit masonry: As follows, based on net area:

1. f'm = 1500 psi (10.3 MPa)

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Samples for verification of the following:

1. Full-size units for each different exposed masonry unit required showing full range of exposed colors, textures, and dimensions to be expected in completed construction.

    a. Include size-variation data for Type FBX and Type FBS, verifying that actual range of sizes for brick falls within ASTM C216 dimension tolerances.

2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the Project. Label samples to indicate type and amount of colorant used.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.05 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

a. 40°F to 32°F (4°C to 0°C): Heat mixing water or sand to produce mortar temperatures between 40°F and 120°F (4°C and 49°C).

b. 32°F to 25°F (0°C to -4°C): Heat mixing water and sand to produce mortar temperatures between 40°F and 120°F (4°C and 49°C). Heat grout materials to produce grout temperatures between 40°F and 120°F (4°C and 49°C). Maintain mortar and grout above freezing until used in masonry.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

a. 40°F to 25°F (4°C to -4°C): Cover masonry with a weather-resistant membrane for 48 hours after construction.

b. 25°F to 20°F (-4°C to -7°C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mph (25 km/h).

3. Cold-Weather Cleaning: Use liquid-cleaning methods only when air temperature is 40°F (4°C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot Weather Requirements: Protect unit masonry work when temperatures and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100°F (38°C) and above.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated as follows:

a. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

2. Weight Classification: Normal weight

3. Provide Type II, nonmoisture-controlled units

4. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:

   a. 8 inch (200 mm) nominal: 7-5/8 inch (194 mm) actual

   b. 16 inch (400 mm) nominal: 15-5/8 inch (397 mm) actual

5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated

C. Decorative Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

   a. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated

2. Weight Classification: Normal weight

3. Provide Type II, nonmoisture-controlled units

4. Size: Manufactured to dimensions indicated for non-decorative units

5. Finish: Normal-weight aggregate, split-face finish. Color to be selected by Owner during shop drawing review.

6. Integral Water Repellent: Provide units produced with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.

   a. Product: Subject to compliance with requirements, provide units made with "Dry-Block" by W.R. Grace & Co.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Masonry Cement: ASTM C 91.

1. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch , use aggregate graded with 100 percent passing the No. 16 sieve.

1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite or other sound stone, as required to match Architect's sample.

F. Aggregate for Grout: ASTM C 404.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

H. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

I. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMU, containing integral water repellent by same manufacturer.

K. Water: Potable.

L. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

1. Colored Masonry Cement:

a. Brixment-in-Color; Essroc Materials, Inc.
b. Centurion Colorbond; Lafarge Corporation.
c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
d. Flamingo Color Masonry Cement; Riverton Corporation (The).

2. Colored Portland Cement-Lime Mix:

a. Color Mortar Blend; Glen-Gery Corporation.
b. Centurion Colorbond PL; Lafarge Corporation.
c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
d. Riverton Portland Cement Lime Custom Color; Riverton Corporation

3. Mortar Pigments:

   a. True Tone Mortar Colors; Davis Colors.
   b. Centurion Pigments; Lafarge Corporation.
   c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

4. Cold-Weather Admixture:

   a. Accelguard 80; Euclid Chemical Co.
   b. Morset; Grace: W.R. Grace & Co.

5. Water-Repellent Admixture:

   a. Dry-Block Mortar Admixture; Grace: W.R. Grace & Co.

2.03 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

   1. Billet steel complying with ASTM A 615 (ASTM A 615M).

   2. Grade 60 (Grade 400).

2.04 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

   1. Galvanized carbon-steel wire, coating class as follows:

      a. ASTM A 153, Class B-2, for both interior and exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

   1. Wire Diameter for Side Rods: 0.1483 inch (3.8 mm)

   2. Wire Diameter for Cross Rods: 0.1483 inch (3.8 mm)

C. For single-wythe masonry, provide type as follows with single pair of side rods:

   1. Truss design with continuous diagonal cross rods spaced not more than 16 inches (407 mm) o.c.

2.05 TIES AND ANCHORS - GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

2. Wire Diameter: 0.25 inch (6.4 mm)

C. Steel Sheet: As follows:

1. Galvanized Steel Sheet: ASTM A 526, G 60 (ASTM A 526M, Z 180) (commercial quality), steel sheet zinc coated by hot-dip process on continuous lines prior to fabrication, for sheet-metal ties and anchors in interior walls and in exterior walls when completely embedded in mortar.

D. Galvanized Steel Sheet Thickness: For steel sheet hot-dip galvanized by continuous process prior to fabrication:

a. 0.0785 inch (2.0 mm)

1. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet hot-dip galvanized after fabrication:

a. 0.0747 inch (1.9 mm)

E. Steel Plates and Bars: ASTM A 36 (ASTM A36M), hot-dip galvanized to comply with ASTM A 153, Class B1, B-2, or B-3, as applicable to size and form indicated.

2.06 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches (100 mm) wide.

2.07 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air- entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for job-mixed mortar; and ASTM C 1142 for ready-mixed mortar, of type S.

C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color matching decorative masonry units.

1. Limit pigments to the following percentages of cement content by weight:

a. For mineral oxide pigments and portland cement-lime mortar, not more than 10 percent.

D. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use coarse grout in grout spaces 2 inches (50 mm) or more in least horizontal dimension, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.02 INSTALLATION - GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for decorative unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), nor 1/16 inch (1.5 mm) within the width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m), nor 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh memory.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.06 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcing a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.

2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches (305 mm) beyond opening.

B. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

3.07 LINTELS

Provide masonry lintels where shown and wherever openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

3.08 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches (63 by 76 mm), pour height of 60 inches (1524 mm).

3.09 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints including corners, openings and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

3. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.10 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the project site for his use.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following metal fabrications for the alum system and recirculation system:

1. Rough hardware.

2. Loose bearing and leveling plates.

3. Miscellaneous framing and supports for applications where framing and supports are not specified in other sections.

1.02 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for nonslip aggregates and nonslip aggregate finishes, prefabricated building columns, cast nosings, treads and thresholds, steel floor plate, paint products, and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27 (ASTM A 27M) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.02 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.03 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating,for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

2.04 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

2.06 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.07 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.08 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.

2.09 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning:

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

3.03 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up field painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05 mm) minimum dry film thickness.

B. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.

2. Wood grounds, nailers and blocking.

3. Sheathing.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 06192: "Prefabricated Metal-Plate-Connected Wood Trusses".

1.02 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for the following products:

1. Metal framing anchors.

C. Material Certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

D. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.

1. For each type of preservative treated wood product specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and compliance with applicable standards.

2. For water-borne treated products, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

3. Warranty of chemical treatment manufacturer for each type of treatment.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.

1. Metal framing anchors.

2. Power driven fasteners.

1.04 DELIVERY, STORAGE AND HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.01 LUMBER, GENERAL

A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

1. RIS - Redwood Inspection Service.
2. NLGA - National Lumber Grades Authority (Canadian).
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance issued by inspection agency.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.02 DIMENSION LUMBER

A. For light framing provide "Stud," "No. 3," or "Standard" grade lumber for stud framing (2 to 4 inches thick, 2 to 4 inches wide, 10 feet and shorter) and "Stud" or "No. 3" grade for other light framing (2 to 4 inches thick, 2 to 6 inches wide), any species.

B. For structural light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species:

1. "No. 2" grade.
2. Same species as indicated for structural framing grade below.

C. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species:

1. "No. 2" grade.
2. Southern Pine graded under SPIB rules.

D. For exposed framing lumber provide material complying with the following requirements:

1. Definition: Exposed framing refers to dimension lumber which is not concealed by other work and is indicated to receive a stained or natural finish.

2. Grading: Material hand-selected at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; issue inspection certificate of inspection agency for selected material.

a. Same species and grade as indicated for structural framing.

2.03 BOARDS

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 19 percent maximum, "S-DRY" or KD-19"

a. Moisture Content: 15 percent maximum, "MC-15" or KD-15.

2. Where painted finish is indicated, provide No. 1 Boards per SPIB rules, Select Merchantable Boards per WCLIB rules, or No. 2 Common Boards & Better per WWPA rules.

B. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY or KD-19) and of following species and grade:

1. Redwood Construction Common per RIS rules, Southern Pine No. 2 Boards per SPIB rules, or any species graded Construction Boards or "No. 3 Common" per WCLIB or WWPA rules.

2.04 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction including battens for roof tiles, bucks, nailers, blocking, furring, grounds, stripping and similar members.

B. Fabricate miscellaneous lumber from dimension lumber for sizes indicated and into shapes shown.

C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: Standard" grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 2 Boards per SPIB rules.

2.05 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels.

B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.06 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

A. General: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

B. Roof Sheathing: APA C-C STRUCTURAL I.

1. Exposure Durability Classification: EXTERIOR.

2. Minimum Thickness: As indicated, or 5/8 inches if not indicated.

2.07 CONSTRUCTION PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1 in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.08 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

2.09 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.

2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

2.10 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. General: Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior use, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

   a. Wood framing members less than 18 inches above grade.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach carpentry work to substrate by anchoring and fastening indicated.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

3.02 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key- bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.03 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with N.F.P.A. "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing members of size and spacing indicated.

C. Anchor and nail as shown, and to comply with the following:

1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.

2. Published requirements of manufacturer of metal framing anchors.

3. "Table 1705.1 - Fastening Schedule," of the Standard Building Code.

D. Do not splice structural members between supports.

E. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely-fitted wood blocks of nominal 2-inch thick lumber of the same width as framing members.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in Form No. E 30, "APA Design/Construction Guide - Residential & Commercial," for types of plywood products and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Sheathing: Nail to framing.

2. Plywood Backing Panels: Nail to supports.

END OF SECTION

SECTION 06192

PREFABRICATED
METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following for the alum system and recirculation system:

1. Gable-shaped trusses.

2. Hip and girder trusses at hip ends of roof.

B. Roof sheathing is specified in Section 06100: "Rough Carpentry".

1.02 DEFINITIONS

A. Prefabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the project site.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for lumber, metal plates, hardware, fabrication process and fasteners.

C. Shop drawings indicating species, species group, sizes and stress grades of lumber to be used; pitch, span, camber, configuration, and spacing for each type of truss required; type, size, material, finish, design values, and location of metal connector plates; and bearing details.

1. To the extent engineering design considerations are indicated as fabricator's responsibility, include design analysis indicating loading, assumed allowable stress, stress diagrams and calculations, and other information needed for review that have been signed and sealed by a qualified professional engineer responsible for their preparation.

2. Provide shop drawings that have been signed and stamped by a qualified professional engineer licensed to practice in the jurisdiction where trusses will be installed.

D. Product certificate, signed by an officer of fabricating firm, indicating that metal-plate-connected wood trusses supplied for Project comply with specified requirements.

1.04 QUALITY ASSURANCE

A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI)publications:

1. "Design Specification for Metal Plate Connected Wood Trusses".

2. "Commentary and Recommendations for Handling and Erecting Wood Trusses".

3. "Commentary and Recommendations for Bracing Wood Trusses".

4. "Quality Standard for Metal Plate Connected Wood Trusses".

B. Connector Plate Manufacturer's Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality control procedures for manufacture of connector plates published in TPI "Quality Standard for Metal Plate Connector Manufacture".

C. Wood Structural Design Standard: Comply with applicable requirements of N.F.P.A. "National Design Specification for Wood Construction".

D. Single-Source Engineering Responsibility: Provide trusses engineered by the metal plate connector manufacturer to support superimposed dead and live loads indicated, with design approved and certified by a qualified engineer.

E. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal-plate-connected wood trusses similar to those of this Project and with a record of successful in-service performance.

F. Fabricator's Qualifications: A firm that complies with the following requirements for quality-control and is experienced in prefabricating metal-plate-connected wood trusses similar to those of this Project that have a record of successful in-service performance.

1. Fabricator participates in a recognized quality assurance program that involves inspection by SPIB; Timber Products Inspection, Inc.; Truss Plate Institute; or other independent inspection and testing agency acceptable to Architect and authorities having jurisdiction.

G. Single Source Responsibility for Connector Plates: Provide metal connector plates from a single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Handle and store trusses with care, and comply with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause which trusses are not designed to resist or endure.

1.06 SEQUENCING AND SCHEDULING

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.01 CONNECTOR PLATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connector plates which may be incorporated in the work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.
2. Bemax of Florida, Inc.
3. Clary Corporation.
4. Gang Nail Systems, Inc.
5. Truswal Systems Corp.

2.02 LUMBER

A. Factory mark each piece of lumber with type, grade, mill and grading agency.

B. Lumber Standard: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

C. Inspection Agencies: Inspection agencies and the abbreviations used to reference them to lumber grades and species include the following:

1. NLGA - National Lumber Grades Authority (Canadian).
2. SPIB - Southern Pine Inspection Bureau.
3. WCLIB - West Coast Lumber Inspection Bureau.
4. WWPA - Western Wood Products Association.

D. Nominal sizes are indicated, except as shown by detail dimensions.

E. Provide dressed lumber, S4S, manufactured to actual sizes required by PS 20 to comply with requirements indicated below:

1. Moisture Content: Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2. Grade for Chord Members: "No. 1".

3. Grade for Web Members: Same grade as indicated for chord members.

4. Species: Any species graded under WWPA or WCLIB rules, Southern Pine graded under SPIB rules, or Spruce-Pine-Fir graded under NLGA rules.

2.03 METAL CONNECTOR PLATES

A. General: Fabricate connector plates from metal complying with the following requirements.

B. Hot-Dip Galvanized Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 446, Grade A; zinc-coated by hot-dip process to comply with ASTM A 525, Designation G60; minimum coated metal thickness indicated but not less than 0.036 inch.

C. Electrolytic Zinc-Coated Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 591, Coating Class C, and, for structural properties, with ASTM A 446, Grade A; zinc-coated by electro-deposition; with minimum coated metal thickness indicated but not less than 0.047 inch.

D. Aluminum-Zinc Alloy-Coated Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 792, Coating Designation AZ 50, and, for structural properties, with ASTM A 446, Grade A; aluminum-zinc alloy-coated by hot-dip process; with minimum coated metal thickness indicated but not less than 0.036 inch.

E. Stainless Steel Sheet: Chromium nickel steel sheet complying with ASTM A 167, Type 304, and, for structural properties, ASTM A 446, Grade A; with minimum metal thickness indicated but not less than 0.035 inch.

F. Any metal indicated above.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where truss members are exposed to weather or to high relative humidities, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.05 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which reports exist from a model code organization acceptable to authorities having jurisdiction that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.

2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 46, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

2.06 FABRICATION

A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required to withstand design loadings for types of joint designs indicated.

C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances specified in TPI "Quality Standard for Metal Plate Connected Wood Trusses". Position members to produce design camber indicated.

D. Connect truss members by means of metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Erect and brace trusses to comply with recommendations of referenced TPI Standards.

B. Where trusses do not fit, return them to fabricator and replace with trusses of correct size; do not alter trusses in the field.

C. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

D. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

G. Do not cut or remove truss members.

END OF SECTION

SECTION 07180

WATER REPELLENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes surface preparation and application of clear water repellent coating to the following vertical and non-traffic horizontal exposed surfaces:

1. Exterior concrete unit masonry.

B. Related Sections: The following sections contain requirements that relate tot his Section:

1. Division 7 Section "Joint Sealants" for joint fillers and sealants.

2. Division 9 Section "Painting" for paints and coatings.

1.02 SUBMITTALS

A. General: Submit the following according to the Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface specified, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

C. Samples: Submit 16-inch-square samples of each substrate indicated to receive water repellent, the specified with repellent treatment applied to half of each sample.

D. Certification by water repellent manufacturer that products supplied comply with local regulations controlling:use of volatile organic compounds (VOC).

E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of water repellents with Performance Requirements specified in the "Quality Assurance" article.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who employs only persons trained and approved by water repellent manufacturer for installation of manufacturer's products.

B. Manufacturer Qualification: Firm experienced in manufacturing products similar to those indicated for this Project and that has a record of successful in-service performance.

C. Regulatory Requirements: Comply with applicable rules of the pollution-control regulatory agency having jurisdiction in the Project locale regarding volatile organic compounds (VOC) and use of hydrocarbon solvents.

D. Performance Requirements: Indicate test results for water repellents on substrate simulations, as close as possible. Use same materials and methods of application as to be used on the Project.

1. Absorption Tests: Comparison of treated and untreated specimens:

a. Concrete Masonry Units: ASTM C 140.

2. Water Vapor Transmission: ASTM E 96. Comparison of treated and untreated specimens.

3. Water Penetration and Leakage Through Masonry: ASTM E 514.

4. Chloride ion Intrusion: National Cooperative Highway Research Program (NCHRP) Report 244, Series II tests for percent reduction of water absorption and percent reduction in chloride content in concrete.

1.04 PROJECT CONDITIONS

A. Weather and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer) under any of the following conditions:

1. Ambient temperature is less than 40°F (4°C).

2. Substrate surfaces have cured for less than one month.

3. Rain or temperature below 40°F (4°C) are predicted for a period of 24 hours.

4. Earlier than 24 hours after surfaces became wet.

5. Substrate is frozen or surface temperature is less than 40°F (4°C).

6. Windy condition such that repellent may be blown to vegetation or substrates not intended.

1.05 WARRANTY

a. Submit a written warranty, executed by the Applicator and water repellent manufacturer covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

B. Warranty Period: 5 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

B. Silane, 20 Percent Solids:

1. Aridox 20, Anti-Hydro Company, Inc.
2. Weather Worker S-20, Dayton Superior Corp.
3. Hydrozo Enviroseal 20, Hydrozo Inc.
4. Pentane, L & M Construction Chemicals, Inc.
5. Klere-Seal 920-S, Pecora Corporation.
6. Penetrating Sealer 20, Sonneborn Building Products.
7. Stontite S19 20, Stonhard, Inc.

C. Siloxane:

1. Prime-A-Pell 200, Chemprobe Corporation.
2. Euco Weather-Guard, The Euclid Chemical Company.
3. Shed OX, L & M Construction Chemicals, Inc.
4. Klere-Seal 908-SX, Pecora Corporation.
5. Weather Seal Siloxane, ProSoCo, Inc.
6. Stontite SX9, Stonhard, Inc.

D. Low-Solids Acrylic:

1. VIP Ombrella 9500, The Flood Company.
2. A-H Acrylic Sealer No. 561, Anti Hydro Company, Inc.
3. Klere-Seal 900, Pecora Corporation.
4. Sure Klean Acrylic Weather Seal 7-1/2 percent, ProSoCo, Inc.

E. Blends and Proprietary Water Repellents:

1. Rain Stop, Conspec, Inc.
2. Clear Double 7, Hydrozo, Inc.
3. Hydropel 8-16 Percent, L & M Construction Chemicafs, Inc.
4. Stifel, Nox-Crete, Inc.

F. VOC Complying Water Repellents (Type):

1. Aquatrete, Huls America (water-based silane, 100 percent solids, site mix 1:9 with water).

2. Hydrozo Enviroseal 20, Hydrozo, Inc. (water-based silane, 20 percent solids).

3. Baracade M.E., Tamms Industries (water-based siloxane, 100 percent solids, site mix 1:9 with water).

2.02 WATER REPELLENTS

A. Silane, 20 Percent Solids: Penetrating water repellent. A monomeric compound containing approximately 20 percent alkyltrialkoxysilanes with alcohol, mineral spirits, water, or other proprietary solvent carrier.

B. Siloxanes: Penetrating water repellent. Alkylalkoxysiloxanes that are oligomerous with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier.

C. Low-Solids Acrylic: Water-clear, breathing coating of acrylic resins, water-based, solvent-based, or acrylic emulsions solution containing less than 15 percent solids by volume.

D. Blends and Proprietary Water Repellents: May be composed of one or several different resins (silanes, siloxanes or acrylic), polymers, stearates, or oils plus other compounds or products of components that the manufacturer prefers not to publish.

E. VOC-Complying Water Repellents: Products certified by the manufacturer to comply with local regulations controlling use of volatile organic compounds.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrate of substances which might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's instructions, to ensure that surface is sufficiently dry.

B. Test for pH level, according to repellent manufacturer's instructions, to ensure chemical bond to silicateous minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass where there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass. Immediately clean water repellent from adjoining surfaces complying with manufacturer's cleaning recommendations.

D. Coordination with Sealants: Do not apply water repellent until the sealants for joints adjacent to surfaces receiving water repellent treatment have been installed and cured.

1. Water repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the Work.

E. Test Application: Prior to performance of water repellent work, including bulk purchase or delivery of products, prepare a small application in an unobtrusive location and in a manner acceptable to the Architect, demonstrate the final effect (visual, physical, and chemical) of planned installation. Proceed with work only after Architect accepts test application or as otherwise directed.

1. Revision of planned installation, if any, and as requested by Architect, will be by change order where it constitutes a departure from requirements of contract documents at time of contracting.

3.02 INSTALLATION

A. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's instructions and recommendations using airless spraying procedure unless otherwise indicated.

1. Precast Work: At Contractor's option, first application of water repellent on precast concrete units may be completed prior to installing units. Mask sealant-bond surfaces to prevent water repellent from migrating onto joint surfaces.

B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if printed recommendations are not applicable to Project conditions.

C. Remove protective coverings from adjacent surfaces.

END OF SECTION

SECTION 07580

ASPHALT SHINGLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish and install a reinforced fiberglass asphalt shingle roof complete with moisture shedding underlayment, eave edge protection, valley and ridge protection, and associated protective flashing, as indicated on Drawings and specified herein.

B. Shingle material shall have a Class A fire rating installed over a wood substrate surface.

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. Section 06100 - Rough Carpentry

1.03 SUBMITTALS

A. Certificates of Compliance: Submit manufacturer's certification that roof shingle materials meet the specification requirements.

B. Submit manufacturer's data for shingle type and colors available for selection and complete installation instructions.

C. Submit sample of material of the selected color for verification.

D. Submit manufacturer's materials warranty covering a period of 10 years minimum.

PART 2 - PRODUCTS

2.01 ROOFING

A. Roofing Shingles: Roofing shingles shall have a laminated, dimensional look similar to GAF woodline series fiberglass base, weighing not less than 240 lbs per square, size 12" x 36", 80 shingles per square, Class "A" fire rating conforming to ASTM Specification D 3018, Type 1 and ASTM D 3462. Shingles shall be factory treated to resist fungus growth, and be so certified.

2.02 SHEET METAL

A. All sheet metal flashing and drip edge shall be flat sheet shop formed 0.023 inches thick aluminum matching color of fascia as selected.

2.03 ROOFING FELT

A. Asphalt-impregnated glass mat: ASTM D 2178, Type IV Asphalt.

2.04 NAILS

A. Non-ferrous or galvanized steel, 11 or 12 gauge barbed shank with 3/8" heads. Provide metal discs for nailing underlayment.

2.05 ROOFING CEMENT

A. Asphalt plastic cement: ASTM D 2822, Type 1.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Underlayment: Apply a single layer of glass felt over the entire roof surface. Lap underlayment 2 inches at edges and 4 inches at end laps. Install underlayment over all hips and nails 6 inches from both sides. Off-set end laps at least 6 feet from course to course.

1. Over the previously applied single layer of underlayment, apply an additional layer at all hips and ridges. Apply continuous in 24-inch strips embedded in plastic roofing cement and nail at edges on 12-inch centers. Cement all laps and nail. Laps shall be minimum of 6 inches.

B. Steep Slope Application: Immediately upon application, apply two (2) quarter size spots of asphalt plastic cement under each shingle tab, each placed 1-2 inches from each end of the tab and near the bottom of the tab. When tabs are pressed into position, the cement should spread out to the near edge of tab but not be exposed. Do not use excessive roofing cement as it can cause shingles to blister.

C. Application of Shingles: Apply shingles in a diagonal or vertical pattern in strict accordance with the manufacturer's application manual for the type of shingle used.

1. Use four (4) fasteners per shingle, leaving none exposed. Fasteners must be of sufficient length to penetrate through the roofing material and at least 3/4-inch into wood decking or through plywood.

2. Staple, if used, shall be 16 gauge zinc coated with 1-inch nominal crown. Staple crown must parallel tab edge and bear lightly against shingle without cutting the surface.

D. Ridge and Hip Caps: Install vertical hip caps and horizontal ridge caps at all locations where roof plans or surfaces change direction; install as recommended by roofing manufacturer.

END OF SECTION

SECTION 07901

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below.

   a. Perimeter joints between concrete and masonry and frames of doors and louvers.

   b. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

   a. Control, expansion, and isolation joints in cast-in-place concrete slabs.

   b. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:

   a. Perimeter joints of exterior openings where indicated.

   b. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

   a. Control and expansion joints in cast-in-place concrete slabs.

   b. Other joints as indicated.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrate.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Contract Conditions and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

C. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants. or other causes.

1.06 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40°F (4.4°C).

2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. Compatibility: Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.02 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

2.03 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Butyl Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

B. Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Butyl Sealant:

a. "BC-158," Pecora Corp.
b. "PT1757," Protective Treatments Inc.
c. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
d. "Tremco Butyl Sealant." Tremco Inc.

2.04 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, non-sag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on inferior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:

a. "AC-20," Pecora Corp.
b. "Sonolac," Sonneborn Building Products Div., ChemRex Inc.
c. "Tremco Acrylic Latex 834." Tremco Inc.

2.05 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, nonextruding strips of flexible, non-gassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.

2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nongassing in unruptured state.

3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

4. Any material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sea substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturers and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants; oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required~ to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.

b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers or back of joints where backer rods are not used.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration, per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

A. Protect joint sealant; during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and reseal joints with new materials to produce joint sealant installations with repaired areas indistinguishable from original work.

END OF SECTION

ELASTOMERIC JOINT SEALANT DATA SHEET

Base Polymer:	Urethane
Type:	S (single component)
Grade:	NS (non-sag)
Class:	25
Additional Movement Capability:	35 percent movement in extension and 35 percent in compression for a total of 70 percent movement
Use(s) Related to Exposure:	T (traffic) and NT (non-traffic)
Uses Related to Joint Substrates:	M, A, and, as applicable to joint substrates indicated, O
Use O Joint Substrates:	Galvanized steel and wood

SECTION 08120

ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes exterior aluminum doors and frames for the alum system.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide aluminum doors and frames that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.

B. Design Requirements: Provide aluminum doors and frames that comply with structural performance, air infiltration, and water penetration requirements indicated.

1. Wind Loads: Provide assemblies capable of withstanding wind pressures of 30 psf inward and 30 psf outward acting normal to the plane of the wall.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each aluminum door and frame type required, including:

1. Manufacturer's standard details and fabrication methods.

2. Data on finishing, hardware and accessories.

3. Recommendations for maintenance and cleaning of exterior surfaces.

C. Samples for Verification Purposes: The Architect reserves the right to require additional samples, that show fabrication techniques and workmanship, and design of hardware and accessories.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum doors and frames in the manufacturer's original protective packaging.

B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.

1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors and frames which may be incorporated in the work include, but are not limited to, the following:

1. Cline Aluminum Doors, Inc.
2. Endure-A-Lifetime Products, Inc.
3. Special-Lite, Inc.
4. United States Metal Manufacturing Corp.

2.02 MATERIALS

A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods, and wire.

B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.

2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.

C. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible, provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

D. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

E. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

2.03 HARDWARE

A. General: Refer to Division 8 Section "Door Hardware" for requirements for hardware items other than those indicated to be provided by the door and frame manufacturer.

B. Thresholds: Extruded aluminum threshold of size and design indicated in mill finish, complete with anchors and clips, coordinated with pivots and floor-concealed closers.

2.04 COMPONENTS

A. Entrance Door Frames: Fabricate entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads.

B. Flush Panel-Type Aluminum Doors: Provide flush panel-type doors fabricated with tubular frame members with reinforced mechanical or welded joints. Provide aluminum face sheets, mechanically interlocked with frame members or laminated to panel core material and framing with waterproof glue.

1. Louvers: Provide louvered openings as indicated, with aluminum moldings and stops. Provide non-removable stops on the exterior.

2.05 FABRICATION

A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings.

B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the project site. Disassemble components only as necessary for shipment and installation.

C. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.

1. Do not drill and tap for surface-mounted hardware items until time of installation of project site.

D. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.

1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

E. Reinforcing: Install reinforcing as required for hardware and necessary for performance requirements, sag resistance and rigidity.

F. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric type, or a gasket between the surfaces. Do not use coatings containing lead.

G. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

H. Fasteners: Conceal fasteners wherever possible.

I. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

1. Provide EPDM or vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

J. Flush Doors: Use facing sheets with a vertical ribbed, an embossed, or a plain smooth] surface. Use one of the following constructions:

1. A phenolic resin-impregnated kraft paper honeycomb core, surrounded at edges and around glass and louvered areas with extruded aluminum shapes. The impregnation of core shall have a minimum of 18 percent resin content. Provide sheet aluminum door facings, not less than 0.032-inch thick laminated to a 0.10-inch thick tempered hardboard backing, and bond the backing to the honeycomb core. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.

2. A solid fibrous core, surrounded at edges and around glass and louvered areas and cross-braced at intermediate points with extruded aluminum shapes. Use aluminum facing sheets of not less than 0.050-inch thickness. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.

3. Form from extruded tubular stiles and rails mitered at corners, reinforce, and continuously weld at miters. Facing sheets shall consist of 0.032-inch thick sheet aluminum internally reinforced with aluminum channels or Z-bars placed horizontally not more than 16 inches apart and extending full width of panel. Fit spaces between reinforcing with sound-deadening insulation. Facing sheets shall finish flush with faces of stiles and rails and be welded to reinforcing bars or channels and to stiles and rails.

K. Louvers: Extruded aluminum lovers inset in door, flush with face on both sides, inverted Y type with stormproof baffle. Provide aluminum mesh insect screen omn interior face of louver. Finish louver same as door and frame.

2.06 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Baked Enamel (Primed-for-Paint) Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting modified acrylic enamel primer system complying with AAMA 603.8, and suitable for field painting.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation.

B. Set units plumb, level, and true to line, without warp or rack of frames or doors. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

C. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.

2. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.

3. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant.

D. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

E. Set thresholds in bed of sealant to provide weathertight construction. Comply with requirements of Division 7 for sealant.

3.02 CLEANING

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum doors and frames will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes items known commercially as finish door hardware that are required for swing, sliding and folding doors, except special types of unique hardware specified in the same section as the doors and door frames on which they are installed for the alum system.

B. This Section includes the following:

1. Hinges
2. Lock cylinders and keys
3. Lock and latch sets
4. Bolts.
5. Miscellaneous door control devices

C. Products furnished but not installed under this Section include:

1. Cylinders for locks on sectional overhead doors.

1.02 SUBMITTALS

A General: Submit the following in accordance with Contract Conditions and Division 1 Specification Sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Templates for doors and frames to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available, to Owner, Architect and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

1.04 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and included basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Butts and Hinges:

    a. Hager Hinge Co.
    b. Lawrence Brothers, Inc.
    c. McKinney Products Co.
    d. H. Soss & Company
    e. Stanley Hardware, Div. Stanley Works.

2. Cylinders and Locks:

    a. Best Lock Corp.
    b. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
    c. Sargent Manufacturing Company.
    d. Schlage Lock, Div. Ingersoll-Rand Door Hardware Group.
    e. Yale Security Inc.

3. Bolts:

    a. Builders Brass Works Corp.
    b. Glynn-Johnson Corp.
    c. Hager Hinge Co.
    d. H.B. Ives, A Harrow Company.
    e. Quality Hardware Mfg. Co., Inc.; Div. Newman Tonks, Inc.
    f. Stanley Hardware, Div. Stanley Works.

4. Overhead Closers:

   a. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
   b. LCN, Div. Ingersoll-Rand Door Hardware Group.
   c. Norton Door Controls, Div. Yale Security Inc.
   d. Rixson-Firemark, Div. Yale Security Inc.
   e. Yale Security Inc.

5. Door Control Devices:

   a. Brookline Industries, Div. Yale Security Inc.
   b. Builders Brass Works Corp.
   c. Glynn-Johnson Corp.
   d. H. B. Ives, A Harrow Company.
   e. Triangle Brass Manufacturing Company (Trimco).

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this section. Products are identified by using hardware designation numbers of the following.

   1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is specified under the Article "Manufacturers" for each product type, the comparable product of one of the other manufacturers that complies with requirements.

   2. ANSI/BHMA/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

      a. Template Hinge Dimensions: ANSI/BHMA A156.7
      b. Materials & Finishes: ANSI/BHMA A156.18

2.03 MATERIALS AND FABRICATION

A. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI/BHMA A156 series standard for each type hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" surfaces to receive painted finish.

D. Provide concealed fasteners for hardware units that are exposed when door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.04 HINGES AND BUTTS

A. Templates: Provide only template- produced units.

B. Screws: Furnish Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.

2. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Non-removable pins.

2. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

D. Number of hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

2.05 LOCK CYLINDERS AND KEYING

A. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

B. Equip locks with manufacturer's special 6-pin tumbler cylinder, with construction master key feature, that permits voiding of construction keys without cylinder removal.

C. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

D. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation "DO NOT DUPLICATE".

E. Key Material: Provide keys of nickel silver only.

F. Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.

1. Furnish one extra blank for each lock.

2. Deliver keys to Owner.

2.06 LOCKS AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3-piece, anti-friction latchbolts as recommended by manufacturer.

2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.

3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

B. Lock Throw: Provide 5/8-inch minimum throw of latch used on pairs of doors.

C. Flush Bolt Heads: Minimum of ½-inch diameter rods of brass, bronze or stainless steel, with minimum 12-inch long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

2.07 HARDWARE FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as may be otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware" for Standard Steel Doors and Frames" by the Door and Hardware Institute.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

3.03 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

2. Lockset Designs: Provide the lockset design designated below, [or, if by another manufacturer, one that matches those designated]:

a. Corbin Russwin CK4200 Series, "Global" knob design, GRC knob and escutcheon.

Exterior Swing Door (Single):

1.5 pr	Butts	BB1191 (Hager) 4½ x 4½	NRP	630
1 ea	Lockset	CK4251 x GRC		630
1 set	Weatherstrip	By door supplier		
1 ea	Closer	4040 x PA x cushion stop		630
1 ea	Threshold	By Door supplier		

Exterior Swing Doors (Pair):

3 pr	Butts	BB1191 (Hager) 4½ x 4½	NRP	630
1 ea	Lockset	CK4251 x GRC		630
2 ea	OH Holder	GJ03 (Glynn-Johnson)		626
1 set	Weatherstrip	By door supplier		
1 ea	Threshold	By Door supplier		

Overhead Sectional Door:

1 ea	Cylinder	630

Balance of hardware by door supplier.

END OF SECTION

SECTION 09900

PAINTING AND SPECIAL COATINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1.02 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each paint and special coating system specified, including block fillers and primers.

1. Provide the manufacturer's technical information including label analysis, and instructions for handling, storage, and application of each material proposed for use.

2. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

C. Samples for initial color selection in the form of manufacturer's color charts.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

D. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.

1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.

3. Submit samples on the following substrates for the Architect's review of color and texture only:

   a. Concrete: Provide two 4-inch-square samples for each color and finish.

   b. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.

   c. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F (7°C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.05 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50°F (10°C) and 90°F (32°C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C).

C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent; or at temperatures less than 5°F (3°C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to those listed in the painting schedules at the end of the Section.

2.02 COATING MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint shall be thoroughly dry before paint is applied.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected.

2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

4. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

   a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

   b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

5. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).

   a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.

   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

6. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

A. Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.

2. Provide finish coats that are compatible with primers used.

3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface according to the manufacturer's directions.

4. Apply additional coats if undercoats or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.

6. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

7. Sand lightly between each succeeding enamel coat.

8. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

1. Brushes: Use brushes best suited for the material applied.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer, to material that is required to be painted or finished and has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.04 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates indicated.

B. Ferrous Metal: Primer is not required on shop-primed items.

1. Full-Gloss Alkyd Enamel: Two finish coats over primer.

Primer: Synthetic rust-inhibiting primer.

Devoe:	51701 Wonder-Prime Interior All Purpose Latex Primer Sealer and Vapor Barrier.
Glidden:	5210 Glid-Guard Universal Fast-Dry Metal Primer.
Moore:	IronClad Retardo Rust-Inhibitive Paint #163.
PPG:	6-208 Red Inhibitive Metal Primer.
P & L:	Effecto Rust-Inhibiting Primer.
S-W:	Kem Kromik Metal Primer B50N2/B50W1.

First and Second Coats: Gloss alkyd enamel.

Devoe:	70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
Glidden:	4500 Glid-Guard Industrial Enamel.
Moore:	Impervo High-Gloss Enamel #133.
PPG:	54 Line Quick-Dry Enamel.
P & L:	Effecto Enamel.
S-W:	Industrial Enamel B-54 Series.

C. Zinc-Coated Metal:

1. High-Gloss Alkyd Enamel: Two finish coats over primer.

Primer: Galvanized metal primer.

Devoe:	13201 Mirrolac Galvanized Metal Primer.
Glidden:	5229 Glid-Guard All-Purpose Metal Primer.
Moore:	IronClad Galvanized Metal Latex Primer #155.
PPG:	6-215/216 Speedhide Galvanized Steel Primer.
P & L:	P & L Interior Trim Primer.
S-W:	Galvite B50W3.

First and Second Coats: Gloss Alkyd enamel.

Devoe:	70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
Glidden:	4500-Line Glid-Guard Industrial Enamel.
Moore:	Impervo High-Gloss Enamel #133.
PPG:	54 Line Quick-Dry Enamel.
P & L:	Effecto Enamel.
S-W:	Industrial Enamel B-54 Series.

D. Aluminum:

1. High-Gloss Alkyd Enamel: Two finish coats over primer.

Primer: Alkyd-type primer.

Devoe:	41820 Bar-Ox Alkyd Shop/Field Primer Grey.
Glidden:	5229 Glid-Guard All-Purpose Metal Primer.
Moore:	No Primer Required.
PPG:	6-712 Speedhide Inhibitive Metal Primer, White.
P & L:	Effecto Primer Red or White.
S-W:	No Primer Necessary.

First and Second Coats: Gloss alkyd enamel.

Devoe:	70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
Glidden:	4500-Line Glid-Guard Industrial Enamel.
Moore:	Impervo High-Gloss Enamel #133.
PPG:	54 Line Quick-Dry Enamel.
P & L:	Effecto Enamel.
S-W:	Industrial Enamel B-54 Series.

3.07 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Concrete , Including Floors:

1. High-Performance, Polyamide-Epoxy Coating: Provide three (3) coats with total dry film thickness not less than 6 mils.

First, Second and Third Coats: High-performance, polyamide-epoxy coating.

Broadcast sand in wet second coat.

Tnemec Series 66 Hi-Build Epoxoline.

C. Concrete Masonry Units:

1. High-Performance, Polyamide-Epoxy Coating System: Provide two finish coats with total dry film thickness not less than 4 mils over concrete masonry block filler.

Filler Coat: Concrete masonry block filler.

Tnemec: 130-6601 Envirofill.

First and Second Coats: High-performance, polyamide-epoxy coating.

Tnemec Series 66 Hi-Build Epoxoline.

D. Ferrous Metal:

1. Full-Gloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

Primer: Synthetic, quick-drying, rust-inhibiting primer.

Devoe:	51701 Wonder-Prime Interior All Purpose Latex Primer Sealer and Vapor Barrier.
Glidden:	5210 Glid-Guard Universal Fast-Dry Metal Primer.
Moore:	IronClad Retardo Rust-Inhibitive Paint #163.
PPG:	6-208 Red Inhibitive Metal Primer.
P & L:	Effecto Rust-Inhibiting Primer.
S-W:	Kem Kromik Metal Primer B50N2/B50W1.

Undercoat: Interior enamel undercoat.

Devoe:	8801 Velour Alkyd Enamel Undercoat.
Glidden:	4500 Glid-Guard Alkyd Enamel.
Moore:	Moore's Alkyd Enamel Underbody #217.
PPG:	6-6 Speedhide Quick-Dry Enamel Undercoater.
P & L:	Interior Trim Primer.
S-W:	ProMar 200 Alkyd Enamel Undercoater B49W200.

Finish Coat: Exterior, gloss, alkyd enamel.

Devoe:	70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
Glidden:	4500 Glid-Guard Industrial Enamel.
Moore:	Impervo High-Gloss Enamel #133.
PPG:	54 Line Quick-Dry Enamel.
P & L:	Effecto Enamel.
S-W:	Industrial Enamel B-54 Series.

E. Zinc-coated metal:

1. Full-Gloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

Primer: Galvanized metal primer.

Devoe:	13201 Mirrolac Galvanized Metal Primer.
Glidden:	5229 Glid-Guard All-Purpose Metal Primer.
Moore:	IronClad Galvanized Metal Latex Primer #155.
PPG:	6-215/216 Speedhide Galvanized Steel Primer.
P & L:	P & L Interior Trim Primer.
S-W:	Galvite B50W3.

Undercoat: Interior enamel undercoat.

Devoe:	8801 Velour Alkyd Enamel Undercoat.
Glidden:	4200 Spred Ultra Semi-Gloss Enamel.
Moore:	Moore's Alkyd Enamel Underbody #217.
PPG:	6-6 Speedhide Quick-Dry Enamel Undercoater.
P & L:	Interior Trim Primer.
S-W:	ProMar 200 Alkyd Enamel Undercoater B49W200.

Finish Coat: Exterior,gloss, alkyd enamel.

Devoe:	70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
Glidden:	4500 Glid-Guard Industrial Enamel.
Moore:	Impervo High-Gloss Enamel #133.
PPG:	54 Line Quick-Dry Enamel.
P & L:	Effecto Enamel.
S-W:	Industrial Enamel B-54 Series.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.

2. Fire extinguisher mounting brackets.

1.02 QUALITY ASSURANCE

A. UL-Listed Products: Fire extinguishers UL listed with UL listing mark for type, rating, and classification of extinguisher

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Ansul Fire Protection.
2. Badger-Powhatan.
3. J.L. Industries.
4. Larsen's Manufacturing Co.
5. Modern Metal Products by Muckle.
6. Potter-Roemer, Inc.
7. Samson Metal Products, Inc.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 2-A:10:B:C, 5-lb nominal capacity, in enameled steel container.

2.03 MOUNTING BRACKETS

a. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated. or if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Fasten mounting brackets to structure, square and plumb.

END OF SECTION

SECTION 11231

ALUM FEED SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

1. The Contractor shall furnish and install a complete and operable Alum Feed System capable of delivering to one injection point, alum in controlled amounts proportional to the flow signal from the stormwater flow meter described under Section 11352.

2. It is the intent of these Specifications that the manufacturer furnish and coordinate the products and equipment for each Alum Feed System. The Contractor shall be responsible for ensuring that the manufacturers furnish all the parts and components required for a complete and operable system.

3. The Alum Feed Systems shall be completely automatic.

4. The Contractor shall ensure that the manufacturer works in conjunction with the Instrumentation supplier to assure proper interface on proportional control based on 4-20 ma DC as shown on the Drawings.

5. The systems shall include, but are not limited to, the following:

   a. Alum pump and control system
   b. Sensing devices
   c. Shutoff and control valves
   d. Motors and motor starters
   e. Control and alarm relays
   f. Instrumentation and display panels

6. All components that are subjected to corrosion shall be constructed of chemical and corrosion resistant materials and epoxy coatings.

7. The systems shall comply with all applicable OSHA and NEC rules and regulations.

B. RELATED WORK

1. Section 11352: Remote Stormwater Metering

2. Section 13620: Telemetering System

3. Section 15101: Piping, Valves and Appurtenances

4. Section 16000: Electrical

C. GENERAL DESIGN

1. The pumps supplied shall have the following functions.

   a. The alum pump shall be paced off of an individual stormwater flow meter or by local potentiometer control.

2. Operations:

   a. The corrosion resistant 43 series simplex alum metering pump shall operate at 146 strokes per minute.

   b. The discharge of the pump shall be tied into the line for delivering to the point of application.

   c. The proportional rate shall be controlled by a dosage potentiometer furnished with the feed system.

   d. The pump head shall be equipped with a diaphragm rupture alarm switch to indicate rupture on the control panel.

   e. A timer will be associated with the pump. The timer will start when the pump control panel receives a selected mA signal which is adjustable (4-20 mA). The timer which will be adjusted from 1 to 9 hours will turn off the pump after the desired time and will automatically reset when the signal drops to a selected (variable) mA signal.

1.02 QUALIFICATIONS

A. The equipment shall be products of manufacturers who are fully experiences, reputable, and qualified in the manufacture of the equipment to be furnished. The systems components shall be designed, constructed, delivered, and installed in accordance with the best practices and methods.

B. The systems shall be furnished by a single supplier who shall coordinate the system design for the proper operation of each system. The Alum Feed System shall be as manufactured by Wallace & Tiernan, Inc., or equal.

1.03 SUBMITTALS

A. MATERIALS AND SHOP DRAWINGS

1. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of the General Conditions and Division 1. Submittals shall include at least the following:

a. Certified shop and erection drawings showing all important details of construction, dimensions, and anchor bolt locations. Special conditions shall be fully explained by notes or details.

b. Descriptive literature, bulletins, and/or catalogs of each item of equipment.

c. The empty weight and the maximum operating weight of each major item of equipment.

d. A complete total bill of materials for all equipment.

e. A list of the manufacturers recommended spare parts. Included gaskets, packing, etc., on the list.

f. The recommended summer and winter grades of lubricants along with alternative references to equal products of other manufacturers.

g. Complete motor data.

h. Complete wiring diagrams and schematics of each control panel, controllers, control device and operators station furnished under this Section.

i. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels, etc., including connections to work of other Sections.

j. Data on the characteristics and performance of all pumps.

k. Manufacturer's installation requirements.

l. Narrative description of controls.

B. ADDITIONAL INFORMATION

1. In the event that it is impossible to conform with certain details of the Specifications, describe completely all non-conforming aspects.

2. Provide equipment warranty.

C. OPERATING INSTRUCTIONS

1. Five (5) copies of operating and maintenance instructions shall be furnished to the Owner's Representative. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

2. A factory representative who has a complete knowledge of the proper operating and maintenance shall be provided to instruct representatives of the Owner and the Owner's Representative on proper operation and maintenance of the equipment. This work may be conducted in conjunction with the inspection of installation and test run as provided under part 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation, and field testing of all materials, equipment, and apparatus as required. Any additional auxiliary equipment necessary for the proper operation of the proposed installation not mentioned in these Specifications, or shown on the Drawings shall be furnished and installed.

B. The material covered by these Specifications is intended to be standard equipment of proven ability and as manufactured by reputable concerns having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with best practice and methods and shall operate satisfactorily when installed as shown on the Drawings.

C. All equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and to be specially adapted for the intended service.

D. All equipment and piping shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed. All bolts, nuts, and washers shall be of stainless steel.

E. Engraved laminated nameplates giving the name and function of all selectors switches, pushbuttons, alarm lights and control devices shall be securely attached to each panel and nameplates with metering pump numbers shall be securely attached to each pump.

F. All electrical materials and equipment shall be Underwriters Laboratories, Inc., listed and shall otherwise be equal to that specified under Division 16.

G. All motors included under this Section shall conform to NEMA Standards, with Class B insulation and temperature rise and designed for operation in a 40°C., ambient. Motors 1 hp and larger shall have a 1.15 service factor. The service factor shall not be used when the equipment is operating under any normal operating condition. Motor horsepower and speed shall be as determined by the system supplier and approved by the Owner's Representative.

H. Removable, all metal guards in complete conformance with OSHA shall be provided for all motor couplings, V-belt drives and similar exposed rotating elements.

I. Each system, when completed, shall be completely dust tight. Equipment installed outdoors shall be weathertight, suitable for outdoor operation.

J. All bolts, nuts, washers, clamps, etc., used to interconnect system components shall be manufacturers standard for this service.

K. Electrical connections to each item of equipment subject to vibration shall be made with flexible liquid tight plastic conduit.

L. The pump shall be equipped with internal stainless steel check valves.

2.02 MATERIALS AND EQUIPMENT

A. Alum feed system to be factory assembled, with the control panel shipped separately.

B. Piston-Diaphragm Metering Pump:

1. The feed pump shall be SCR variable speed with manual stroke length adjustment to attain the maximum capacities at the psi as shown below.

WALLACE & TIERNAN PUMP SPECS			
PISTON DIAMETER (in)	STROKE SPEED (spm)	CAPACITY (gph)	MOTOR (Hp)
2¼	146	214	1

2. The feeder pump shall be of suitable materials for pumping the respective chemical solutions. The pumps shall be positive displacement mechanically activated diaphragm type. Single ball type check valves shall be provided on the suction and discharge, including a reversible seat and replaceable ball guide.

3. A manual adjustment mechanism with speed indicator, to permit 0 to 100 percent capacity control while in motion, shall provide positive repeatable settings within plus or minus 1 percent over the entire range; pump delivery to be repeatable settings within plus or minus 1 percent accuracy over a 20 to 1 range.

4. Pump motor shall be variable speed, direct current driven. The pumps shall automatically vary output proportional to flow based on a 4-20 ma DC signal. The proportional rate shall be set locally.

5. The pumps shall be provided with single stainless steel ball type check valves, on each suction and discharge, with a reversible seat and replaceable ball guide.

6. Pump head arrangement, materials and SCR motor shall be as required to meet maximum discharge pressure.

7. The SCR metering pumps shall have panel-mounted controls and rate indicator with a selector switch for selecting the flow signal or manual control.

C. BACKPRESSURE AND PRESSURE RELIEF VALVES

1. The valves shall be designed to operate with the chemical solutions being pumped.

2. The valve diaphragm shall be made of an elastomer (Hypalon) bonded to a TFE facing.

3. The valve shall operate in the following manner: Line pressure on the diaphragm is opposed by spring compression. When line pressure reaches the valve set in the spring, the diaphragm moves off its seat to dissipate the excess pressure by permitting flow.

4. The valves shall be Wallace and Tiernan valves, KYNAR version.

D. SYSTEM CONTROL PANELS

1. All electrical controls required for the operation and control of the alum pump shall be housed in an individual control panel. One control panel will be required. All devices shall be factory installed, wired, and tested. Terminal blocks shall be provided and tagged as required for power and motor leads, sensor alarm, and protective devices leads. Auxiliary contacts for remote monitoring and indication of alarm conditions shall be provided for future use. Auxiliary contact shall be SPDT, dry type.

2. Cabinet construction shall be 316L Stainless Steel NEMA 3R. All devices mounted on front door shall be NEMA 3R. The panel shall meet all applicable requirements of NEMA and the National Electrical Code. Refer to the electrical drawings for details.

3. The control panel shall be designed for operation on a 120/240 volt, 1-phase, 3-wire power supply as shown on the Drawings. Provide local/remote switches on all cabinets and pumps controls for either automatic pacing or local manual start/stop and rate feed setting. Contactors, relays, and logic shall be NEMA rated, industrial grade, designed for 120 volt power system. All power circuits and wiring between the control panel and the motors, sensors, transformers, etc., shall be field wired under this Section. All exterior wiring shall be enclosed in rigid conduit. Tagged outlets shall be provided for connecting to the main power supply and the control circuit supply.

4. The control panel will have an LED display indicating the mA signal being received by the pump panel.

5. Direct Current Variable Speed Motors.

   a. Each variable speed drive shall be an integrally mounted permanent magnet, direct current motor operated from silicon control rectifier (SCR) hereinafter specified.

   b. Motors shall be standard totally enclosed non-ventilated DC units and of the frame size selected by the manufacturer to prevent overheating when continuously operated at 10 percent speed and constant torque load. Drives shall be suitable for continuous operation over a 20 to 1 speed range within plus or minus 2 percent of selected operating speed. Each pump and drive including coupling and guard shall be factory mounted on a common base and tested.

   c. A thermal switch shall be furnished in each drive motor and wired to stop on high winding temperature.

   d. Motor operating voltage shall be compatible with the output of its SCR controller.

   e. Drive motors shall be suitable for continuous operation over a 20 to 1 speed range.

6. SCR Controllers and Control Panel:

   a. Each SCR Controller shall be a completely solid state unit consisting of an electronic switching amplifier, SCR full wave rectifier and associated circuitry.

   b. SCR units shall be heavy duty type to handle full current rating of motor and brief acceleration currents.

   c. SCR's shall be mounted on heat sinks but electrically isolated therefrom; circuitry shall operate properly over a room temperature range from 50°F to 120°F. All units shall be individually fused.

   d. Each controller shall be furnished with a tachometer feedback speed meter.

   e. Speed indicators shall be calibrated 0 to 100 percent.

   f. All SCR Controllers shall have provisions for accepting a remote 4-20 ma current control signal as specified under Instrumentation for speed control.

   g. All components used for the control of the feed pump speed shall be located within the control panel.

h. The control system for each alum feed pump shall be furnished in each control panel. Each panel shall contain a speed indicator (calibrated 0 to 100 percent), manual potentiometer, local remote selectors switch, start-stop push-button controls, a motor running indicating light (push-to-test) for each pump furnished in the system, diaphragm rupture alarm lights (push-to-test) for each pump head and a totalizer registering in hours the running time of each pump.

i. Each control panel shall include transient surge suppressor as manufactured by Innovative Technology, Model #DB1100.

2.03 TOOLS AND SPARE PARTS

A. All special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment by the manufacturer.

B. Spare Parts: Spare parts shall be furnished to assure normal running and maintenance for a period of one year as recommended by the manufacturer of equipment under this Section. As a minimum the following list shall be provided:

1. Four Diaphragms and seals
2. Four Check seats
3. Two Sets of ball checks
4. Two BP plugs
5. Oil for 2 changes
6. Two boxes of fuses each type
7. Two bulbs for each indicator

C. The manufacturer shall recommend and supply all spare parts in addition to the aforementioned necessary for the first year of operation. Spare parts shall be marked with part numbers and equipment and shall be packed in suitable containers which are also marked with the part numbers and equipment for which it is used.

D. All tools and spare parts shall be furnished in containers clearly identified with indelible markings as to their contents. Each container shall be placed with its contents protected for storage. All tools shall be furnished in steel tool boxes.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations, in the location shown on the Drawings. Installation shall include furnishing the required lubricants for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.

3.02 INSPECTION AND TESTING

A. Contractor is responsible for assuring services, labor and equipment of a manufacturer as specified herein. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. The first visit will be for checking and inspecting the equipment after it is installed. The second visit will be to operate and supervise the initial field test and to instruct the plant personnel in the operation and maintenance of the equipment. The final copies of operation and maintenance manuals must have been delivered to the Owner's Representative prior to scheduling the instruction period with the Owner. These services may be combined with those provided under Article 1.03C, OPERATING INSTRUCTIONS.

B. Upon completion of installation, the manufacturer, in the presence of the Owner's Representative, shall perform a preliminary test over the full range of each system to ensure the functioning of all component parts to the satisfaction of the Owner's Representative. The test shall be over the full range of capacity. The manufacturer shall furnish all labor and equipment. Air and power shall be supplied by the Contractor. Approval of the preliminary test by the Owner's Representative shall not constitute final acceptance of the equipment furnished.

C. After the project is in operation, a full operating test shall be performed in the presence of the Owner's Representative and a qualified manufacture's representative on the system. The manufacturer shall furnish all labor, materials and equipment required for such tests and shall correct any deficiencies noted by repairing or replacing the defective component and retesting as required until the equipment meets the specifications and the satisfaction of the Owner's Representative. A performance check shall be made on each metering pump with alum. Pumps shall be tested at 10 percent, 20 percent, 50 percent, 75 percent and 100 percent of scale, as required. The total error based on the field determined instrument errors, shall not exceed plus or minus two percent of the actual flow for the pumps. If, during running of the tests, one or more points appear to be out by more than the specified amount, the manufacturer's field engineer shall make such adjustments or alternations as are necessary to bring equipment up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance. Thirty days will be allowed for any changes necessary to meet the specifications. Otherwise the Owner reserves the right to have the rejected equipment removed from the site and replaced by satisfactory equipment that operates in accordance with the specifications. Alum for the full operating test will be furnished by the Owner.

END OF SECTION

SECTION 11352

REMOTE STORMWATER METERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

1. The Contractor shall furnish and install one complete and low maintenance operable, stormwater metering system capable of determining stormwater flow rate and transmitting a flow-proportional mA DC signal. The systems will also be capable of transmitting instantaneous data to the sensor display panel and the alum pump controller at the pump vault.

2. It is the intent of these specifications that one manufacturer furnish and install the products and equipment for the stormwater metering system. Badger Meter, Inc. will furnish a 4500 Velocity Meter. The Contractor shall be responsible for ensuring the manufacturers finish all the parts and components required for complete and operable system.

3. The stormwater metering system shall be completely automatic. The sensors and other equipment shall be low maintenance and compatible with stormwater characteristics.

4. The Contractor shall ensure the manufacturers work in conjunction with the Instrumentation supplier to assure proper interface on proportional control based signal as called for herein and as shown on the Drawings.

5. The system shall include, but is not limited to, the following:

   a. Velocity Sensors
   b. Sensor Mounting Hardware
   c. Instrumentation and Digital Display Control Panel with Data Logging Module
   d. Totalizers
   e. Enclosures (NEMA 4X)
   f. Cable
   g. Pull Boxes
   h. Software for Data Logging
   i. PRGS Conduit for Cable Between Sensor and Meter
   j. Lightning Protection

6. All components shall be constructed of chemical and corrosion resistant materials and coatings.

7. The entire system shall comply with all applicable OSHA rules and regulations.

B. RELATED WORK

1. Section 11231: Alum Feed System

2. Division 16: Electrical

C. GENERAL DESIGN

1. The stormwater metering system shall have the following features:

a. Velocity sensor capable of measuring velocity of flow in the pipe from 0.02 to 5.0 ft per second.

b. Display of instantaneous flow and velocity at the pump building. Ability to provide totalized flow at any time.

c. Generates a 4 to 20 mA output signal compatible with alum pump controller.

d. The stormwater meter will have a suitable lightning protector on the AC side, as manufactured by Innovative Technology, Model #DB1000.

e. Each flow transmitter shall include surge protection on the transducer signal measuring stormwater velocity. The surge protector shall be manufactured by EDCO-PCR or equal.

1.02 QUALIFICATIONS

A. The equipment shall be products of manufacturers who are fully experienced, reputable, and qualified in the manufacturer of the equipment to be furnished. The systems components shall be designed, constructed, delivered, and installed in accordance with the best practices and methods.

B. The system shall be furnished by one supplier who shall coordinate the system design for the proper operation of the system. Stormwater metering system shall include one Model 4500 Velocity Meter as manufactured by Badger Meter, Inc.

1.03 SUBMITTALS

A. MATERIALS AND SHOP DRAWINGS

1. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of the General Conditions and Division 1. Submittals shall include at least the following:

a. Descriptive literature, bulletins, and/or catalogs of each item of equipment.

b. The empty weight and the maximum operating weight of each major item of equipment.

c. A complete total bill of materials for all equipment.

d. A list of the manufacturers recommended spare parts.

e. Complete wiring diagrams and schematics of each control panel, controllers, control device and operators station furnished under this Section.

f. Complete wiring diagrams and schematics of all control systems showing wiring requirements between all system components, sensors, control panels, etc., including connections to work of other Sections.

g. Manufacturer's installation requirements.

B. ADDITIONAL INFORMATION

1. In the event that it is impossible to conform with certain details of the Specifications, describe completely all non-conforming aspects.

2. Provide equipment warranty per specifications.

C. OPERATING INSTRUCTIONS

1. Operating and maintenance instructions shall be furnished to the Owner's Representative. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

2. A factory representative who has a complete knowledge of the proper operating and maintenance shall be provided to instruct representatives of the Owner and the Owner's Representative on proper operation and maintenance of the equipment. This work may be conducted in conjunction with the inspection of installation and test run as provided under part 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation, and field testing of all materials, equipment, and apparatus as required. Any additional auxiliary equipment necessary for the proper operation of the proposed installation not mentioned in these Specifications, or shown on the Drawings shall be furnished and installed.

B. The material covered by these Specifications is intended to be standard equipment of proven ability and as manufactured by reputable concerns having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with best practice and methods and shall operate satisfactorily when installed as shown on the Drawings.

C. All equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and to be specially adapted for the intended service.

D. All equipment and piping shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed. All bolts, nuts, and washers shall be of stainless steel.

E. Engraved laminated nameplates giving the name and function of all selectors switches, pushbuttons, alarm lights and control devices shall be securely attached to each panel and nameplates with associated metering pump numbers shall be securely attached to each control panel.

F. All electrical materials and equipment shall be Underwriters Laboratories, Inc., listed and shall otherwise be equal to that specified under Division 16.

G. Each system, when completed, shall be completely dust tight. Equipment installed outdoors shall be weathertight, suitable for outdoor operation.

H. All bolts, nuts, washers, clamps, etc., used to interconnect system components shall be manufacturers standard for this service.

I. Electrical connections to each item of equipment subject to vibration shall be made with flexible liquid tight metal conduit.

2.02 MATERIALS AND EQUIPMENT

A. Flowmeter

1. The flowmeters shall be Badger Meter, Inc. flowmeters with optional data logging module and software or approved equal. The individual flowmeters are as follows:

POINT OF FLOW MEASUREMENT	MODEL NUMBER	SENSOR(S)
1	4500	Velocity

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations, in the location shown on the Drawings. Installation shall include furnishing maximum lightning protection.

3.02 INSPECTION AND TESTING

A. Contractor is responsible for assuring services, labor and equipment of a manufacturer as specified herein. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. The first visit will be for checking and inspecting the equipment after it is installed. The second visit will be to operate and supervise the initial field test and to instruct the plant personnel in the operation and maintenance of the equipment. The final copies of operation and maintenance manuals must have been delivered to the Owner's Representative prior to scheduling the instruction period with the Owner. These services may be combined with those provided under Article 1.03C, OPERATING INSTRUCTIONS.

B. Upon completion of installation, the manufacturer, in the presence of the Owner's Representative, shall perform a preliminary test over the full range of each system to ensure the functioning of all component parts to the satisfaction of the Owner's Representative. The test shall be over the full range of capacity. The manufacturer shall furnish all labor and equipment. Air and power shall be supplied by the Contractor. Approval of the preliminary test by the Owner's Representative shall not constitute final acceptance of the equipment furnished.

C. After the project is in operation, a full operating test shall be performed in the presence of the Owner's Representative and a qualified manufacture's representative on the system. The manufacturer shall furnish all labor, materials and equipment required for such tests and shall correct any deficiencies noted by repairing or replacing the defective component and retesting as required until the equipment meets the specifications and the satisfaction of the Owner's Representative. A performance check shall be made on each metering system. Metering shall be tested at 10 percent, 20 percent, 50 percent, 75 percent and 100 percent of scale, as required. The total error based on the field determined instrument errors, shall not exceed plus or minus two percent of the actual flow. If, during running of the tests, one or more points appear to be out by more than the specified amount, the manufacturer's field engineer shall make such adjustments or alternations as are necessary to bring equipment up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance. Thirty days will be allowed for any changes necessary to meet the specifications. Otherwise the Owner reserves the right to have the rejected equipment removed from the site and replaced by satisfactory equipment that operates in accordance with the specifications.

END OF SECTION

SECTION 13620

TELEMETERING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish and install a communication based telemetering system compatible with the existing City of La Porte SCADA system consisting of field mounted Remote Telemetry Unit hereinafter specified to perform the intended function. Work shall include all necessary materials, equipment, labor, and services.

B. Auxiliary and accessory devices necessary for system operation or performance, such as transducers or relays to interface with existing equipment or equipment provided under other Sections of this Specification, shall be included whether specified or not.

C. The radio telemetering system shall be the manufacturer's most recent version.

D. The Contractor's attention is directed to the fact that the Telemetering System shall be furnished by Communications Services (219) 256-9536 who shall provide all of the services, equipment, and appurtenances required to achieve a fully integrated and operational system.

E. Substitutions on functions or equipment specified will not be accepted. In order to insure the interchange ability of parts, the maintenance of quality, the ease of interfacing between the various subsystems, and the establishment of minimums with regards to ranges and accuracy, strict compliance with the above requirements shall be maintained. In order to insure compatibility between all equipment, it shall be the responsibility of the System Supplier thereunder to coordinate all interface requirements with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.

F. Equipment shall be fabricated, assembled, installed, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as approved by the Engineer.

G. Omission of a specific electrical or electronic item obviously necessary for the proper functioning of the equipment shall not relieve the Contractor of the responsibility of furnishing and installing the item at no additional cost to the Owner.

H. All work specified shall be installed subject to the General Conditions, construction contract, and all other contract documents pertaining to this project.

I. All equipment furnished under this section of the specifications shall be new and unused, and shall be the standard product of a manufacturer having equipment operating successfully in the field.

J. The work shall include one (1) antenna and tower to be located at the alum pump building as directed by the RTU suppliers. The antenna height shall be determined during the construction period.

1.02 DESCRIPTION OF SYSTEM

A. The Radio Telemetry System specified herein is designed to collect, transfer and store accurate, reliable, and timely operating data from remote field instruments and equipment, transfer the data to the computers located at the Owner's treatment facilities, and to allow control of selected equipment from the keyboard.

PART 2 - PRODUCTS

2.01 GENERAL

A. Type:

1. All equipment supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards for the industry.
2. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately converted to compliance standard signals for remote transmission.
3. All equipment shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Drawings or as required.
4. Electronic circuits shall be of the manufacturer's latest design, utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmospheric fluctuations and 0 to 100 percent relative humidity.

B. City of La Porte utilizes the Zetron #1716 RTU.

C. RTU I/O REQUIREMENTS

DESCRIPTION	TYPE	RANGE
Stormwater Flow	AI	0-100 ft^3/sec
Alum Pump Speed	AI	0-100%
Alum Pump Fail	DI	--

D. Each should also include the following items as well as any other materials necessary to complete the installation. All equipment to be mounted in the box and connected except for the lift station input signal cables and the AC outlet box.

1. 1: Kenwood TK-862 UHF Radio with interface cable
2. 1: Zetron #1716 Remote Terminal Unit
3. 1: Opto22 I/O Board with 16 #1AC5 input modules
4. 1: 12-volt Power Supply
5. 1: 12-volt, 7 amp-hour battery
6. 1: Larsen YA2-450 Yagi Antenna with coax and connectors
7. 1: Polyphaser coax lightning protector
8. 1: 10-ft antenna mast
9. 1: Hoffman A24H20CLP Steel Box with mounting panel
10. 1: Hoffman 100-watt heater
11. 1: 110-volt AC outlet

E. It is the intent of these specifications that the telemetry system shall be suitable in every way for the service required. All materials and labor which may be reasonably implies as being incidental to the work shall be furnished by the Contractor at no additional cost to the City. Any deviation from these specifications, without written approval, will not be accepted.

END OF SECTION

SECTION 14210

FIBERGLASS-REINFORCED PLASTIC TANKS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

1. This section covers the furnishing and installation of fiberglass reinforced plastic (FRP) tanks for the storage of alum, $Al_2(SO_4)_3 \cdot 14\ H_2O$.

2. Tanks furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the fabricator unless exceptions are noted by the Engineer.

3. The Contractor shall coordinate the work between the suppliers of equipment to be used with or connected to the storage tanks to ensure that all required provisions for mounting the accessories are included.

4. This work includes all materials and labor for fastening the tank to the anchor slab in accordance with the manufacturer's recommendations.

B. RELATED WORK DESCRIBED ELSEWHERE: Other sections directly related to work covered in this section include the following:

1. Section 15101: Piping, Valves and Appurtenances

1.02 QUALITY ASSURANCE

A. GOVERNING STANDARDS: Except as modified or supplemented herein, all materials and construction methods shall comply with the applicable provisions of the following standards:

1. UL Standard 1316

2. ASTM Standard D4021-86

1.03 SUBMITTALS

A. DRAWINGS AND DATA

1. Complete drawings, details, and specifications covering the storage tanks and accessories shall be submitted.

2. The data shall include full information on basic materials and test data confirming the chemical resistance of the proposed resins to the intended tank contents.

3. The data shall also indicate the sizes of all major tank components including tank diameter, wall thickness, overall length, nozzle details and locations, anchor bolt locations and details, and full information and details concerning field assembly and installation.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The tanks and components shall be adequately protected during transportation, in storage at the job site, and during subsequent installation and construction activities. Damaged units will be rejected and shall be replaced with undamaged units.

1.05 WARRANTY AND GUARANTEES

A. The tank will not fail for a period of two (2) years due to corrosion or structural failure.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Tanks shall be manufactured with 100% resin and glass fiber reinforcement. No sand filler. Basic materials shall be as follows:

1. Resin: Bisphenol-A polyester or vinyl ester resins suitable for use with the specified chemicals.

2. Reinforcement: Glass fiber with a suitable coupling agent.

3. Surfacing Material: Surlington Formed Fabrics "Nexus Veil", Nicofibers "Surmat 100", or equal.

4. Plastic Laminate: Conformity with the applicable governing standards.

5. Exposed Assembly and Bolts, Nuts, and Washers: Type 316 stainless steel.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. CONDITIONS OF SERVICE: Each tank will normally be used to store the specified chemical at atmospheric pressure. The tanks shall be designed for the storage of the following liquid chemicals:

1.	Chemical:	Alum
2.	Location:	As shown
3.	Maximum Concentration Percent by Weight:	50
4.	Maximum Specific Gravity:	1.4
5.	Maximum Temperature (°F):	100
6.	Minimum Temperature Tank Contents (°F):	----

B. DESIGN CRITERIA

1. Each tank shall be designed to withstand the hydrostatic head which would result with the tank and fill line surcharged with the stored liquid chemical to 6 inches above the top of the tank.

2. The following tanks shall be provided:

CAPACITY (gal)	DIAMETER (ft)	LENGTH (ft)
2500	6	13'-6"

3. All tanks shall be designed in accordance with the applicable design standards referenced herein. Design calculations shall be provided for each tank and shall be signed and sealed by a professional engineer registered in the State of Indiana.

2.03 FABRICATION AND MANUFACTURER

A. HORIZONTAL TANKS

1. Each tank shall be of the horizontal cylinder type double-wall fiberglass reinforced plastic tank with dished heads as shown on the drawings.

B. MANUFACTURER

1. The tanks shall be hand lay-up, spray-up, or filament wound construction in accordance with the applicable governing standard. All tank shells and dishes shall be shop fabricated in a controlled environment by the manufacturer and no vertical seams shall be allowed. The finished laminate shall be constructed using a single generic type of thermoset resin throughout and shall not contain colorants, dyes, fillers, or pigments unless otherwise specified. Ultraviolet absorber shall be added to the resin used in the fabrication of tanks indicated on the drawings or specified to be suitable for installation in exposed, exterior locations.

2. The top of each tank shall be reinforced in accordance with the requirements of the applicable governing standard. Additional reinforcement shall be provided as necessary to support the required accessories. The surface of each domed top shall be provided with a non-slip finish.

3. Bracketed flat surfaces shall be provided on each tank for the installation of a liquid level gauge, a nameplate, and a certification plate.

4. Minimum of three lifting lugs shall be provided on each tank as required for handling and installation.

5. All finished tanks shall be factory air tested to a pressure of 5 psi for a duration of one hour. Any leaks detected during the testing shall be repaired by the manufacturer and the tank retested until no detectable leakage is observed.

B. CONCRETE BASES

1. The concrete bases for the tanks shall be constructed in accordance with the provisions of the structural drawings and specifications.

2.04 ACCESSORIES

A. Accessories shall be provided on each tank as indicated on the drawings and as specified herein.

1. Access Manholes: Access manholes shall have an inside diameter of 24 inches and shall be provided on the end of the tank as indicated on the drawings. Each manhole shall be flanged, fully gasketed, and furnished with a fabricated blind flange having the same properties as the tank wall laminate. Gasket materials shall be compatible with and fully resistant to the chemicals stored. Flange diameter and drilling shall conform to ANSI B16.5, Class 150.

2. Flanged Nozzles:

a. Nozzles for connecting piping and accessories shall be provided on each tank at the locations and of the sizes indicated on the drawings or specified herein.

b. Each nozzle shall be flanged, with flange diameter and drilling conforming to ANSI B16.5, Class 150. Nozzles shall extend at least 4 inches from outside face of tank to face of flange.

c. Flanged nozzles shall be fabricated of the same material as the tank and shall be gusseted to the tank or otherwise reinforced in accordance with governing standard.

d. Each tank shall be provided with the following flanged nozzles:

QUANTITY	CONNECTION	NOZZLE SIZE (inches)	LOCATION ON TANK
1	Vent	2	Top
1	Return	1	Top
1	Fill	2	Top
1	Suction	1-1/2	Bottom
1	Inner Wall Monitor		Top

e. Tank shall also have a sight tube with laminated strip chart calibrated in gallons.

3. Vents: Each tank shall be provided with a vent of the size recommended by the manufacturer to prevent drawing a vacuum inside the tank during pumping or draining. The vent shall also be equipped with an insect screen of material compatible with the chemical stored.

4. Certification Plates: A stainless steel certification plate shall be installed on the manway cover. The following data shall be included on the certification plate:

   a. Name of tank fabricator

   b. Date of manufacture

   c. Product to be stored

   d. Maximum allowable concentration, specific gravity and temperature of the specified chemical solution that can be stored safely

   e. Mechanical properties of the laminate

   f. Resin designation

PART 3 - EXECUTION

3.01 INSTALLATION

A. The tanks shall be installed at the interior location, as indicated on the drawings. The tanks shall be installed in accordance with the fabricator's recommendations, the requirements of the applicable governing standard, and to the satisfaction of the Engineer, and made ready for the installation of piping and other appurtenances as indicated on the drawings and specified under other sections.

3.02 FIELD QUALITY CONTROL

A. After completion of installation, the tanks shall be filled with water to the top and allowed to stand full for a period of not less than 48 hours. During testing, flanged connections may be plugged by the installation of temporary blind flanges on the outside of the tank but shall not be blocked or plugged on the inside. All leaks or indications of leaks shall be repaired by the fabricator and made completely watertight. A leaking tank, upon repair, shall be retested to the satisfaction of the Engineer.

3.03 CLEANING

A. When installation has been completed and all connections have been made, all tank surfaces, interior and exterior, shall be thoroughly cleaned as recommended by the fabricator and to the satisfaction of the Engineer. Abrasive cleaning agents shall not be used. The tank and wetted accessories shall be completely dried before being placed into service.

END OF SECTION

SECTION 15101

PIPING, VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

1. The Contractor shall furnish and install all piping, fittings, valves and related materials for all alum suction, discharge and return lines, blower lines, drain line, and water lines required for an operable alum feed system.

2. The Contractor shall coordinate the type of materials and installation procedures with the Alum Feed System equipment specified in Section 11231. Connections to the Alum Feed System shall be made per manufacturer's recommendations.

3. The location of the piping, fittings, and valves shall include the alum feed building and to all remote alum feed locations.

4. Materials under this section shall include, but is not limited to, the following:

   a. Alum suction lines
   b. Alum discharge lines
   c. Alum return lines
   d. Alum fill line
   e. Water lines
   f. Drain line
   g. Fittings
   h. Valves
   i. Alum flow meter
   j. Pressure gauges
   k. Calibration chamber
   l. Safety shower
   m. Air compressor

5. All components that are subjected to corrosion shall be constructed of chemical and corrosion resistant materials and coatings.

6. The entire system shall comply with all applicable OSHA rules and regulations

B. RELATED WORK

1. Section 11231: Alum Feed System
2. Section 11352: Remote Stormwater Metering

C. GENERAL DESIGN

1. The alum suction lines shall transmit alum from the FRP alum storage to the alum simplex metering pump.

2. The alum discharge line shall transmit alum from the pump to the remote alum feed location.

3. The alum fill line shall transmit alum from the delivery tanker truck to the alum storage tank.

4. Check valves are located at the remote alum feed locations to ensure stormwater runoff does not enter the alum line and the line remains full of alum.

5. Back pressure valves and ball valves are located on the discharge side of the pump to ensure the alum remains in the lines.

6. Pressure relief valves are located between the discharge line and the return line.

7. Water lines shall provide water for the safety showers and hose bibbs.

8. The alum flow meter shall accurately measure the range of liquid aluminum sulfate (50%) flows specified (0.05-2.00 gpm).

9. The drain line shall transmit water from the drain to the stormwater system.

1.02 QUALIFICATIONS

A. The materials shall be products of a manufacturer who is fully experienced, reputable, and qualified in the manufacturer of chemical feed materials. The materials shall be designed, constructed, delivered, and installed in accordance with the best practices and methods.

B. A mechanical contractor with a minimum of five years of experience with the installation of similar chemical feed systems shall construct the alum feed system including pumps and all piping, valves, and related appurtenances within the pump vault.

1.03 SUBMITTALS

A. MATERIALS AND SHOP DRAWINGS

1. Copies of all materials required to establish compliance with these specifications shall be submitted in accordance with the provisions of the General Conditions and Division 1. Submittals shall include at least the following:

a. Certified shop and erection drawings showing all piping, fittings, valves, and related appurtenances within the building and FRP alum storage tank area.

b. Descriptive literature bulletins and or catalog of each item to be furnished and installed.

c. A statement from the manufacturer that all supplied material is suitable for use with liquid alum, $Al_2(SO_4)_3 \cdot 14\ H_20$.

d. A list of at least five references for the mechanical contractor for similar chemical feed projects with contacts and phone numbers.

B. ADDITIONAL INFORMATION

1. In the event that it is impossible to conform with certain details of the specifications, describe completely all non-conforming aspects.

2. Provide materials warranty per specifications.

3. All operating and maintenance instructions shall be furnished to the Owner's Representative.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the installation offered. They are, however, intended to cover the furnishing, delivery, installation, and field testing of all materials, and apparatus as required. Any additional materials necessary for the proper operation of the proposed installation not mentioned in these Specifications, or shown on the Drawings shall be furnished and installed.

B. The material covered by these Specifications is intended to be of proven ability and as manufactured by reputable concerns having experience in the production of such materials. The materials furnished shall be designed, constructed, and installed in accordance with best practice and methods and shall operate satisfactorily when installed as shown on the Drawings.

C. All materials shall be designed and proportioned to have liberal strength, stability, and stiffness and to be specially adapted for the intended service.

D. All piping and appurtenances shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed. All bolts, nuts, and washers shall be of stainless steel.

E. Engraved laminated nameplates giving the name and function of all piping and valves shall be securely attached to each in a conspicuous location.

2.02 MATERIALS

A. ALUM FILL LINE, ALUM DISCHARGE LINE, ALUM SUCTION LINE, ALUM RETURN LINE, AND WATER LINE

1. All pipe, fittings and valves shall be **gray (same color) solvent welded Schedule 80 polyvinyl chloride (PVC)** unless otherwise noted on the drawings.

B. DRAIN LINE

1. Drain line pipe and fittings shall be 6" PVC, SDR 35.

C. VALVES (Heyward or approved equal)

1. The valve shall be designed to operate with the chemical solutions being pumped.

2. All valve bodies shall be PVC, Type 1, Grade 1, unless otherwise noted on the drawings.

3. The valve diaphragm shall be made of an elastomer (Hypalon) bonded to TFE facing.

4. Ball valves shall be manually operated with a Teflon seat.

5. Check valves shall be spring compression operated with Hypalon disc.

D. PIPE HANGER

1. Anchors and pipe hangers shall be 316 stainless steel. Hangers shall allow for a 2" wall offset.

E. ALUM METER

1. 1/2-inch meter with all plastic and/or 316 SS internals. Compatible with 50% aluminum sulfate.

F. CAMLOCK FITTINGS

1. 316 Stainless Steel

G. CALIBRATION CHAMBER

1. 4000 cc with PVC Ball Valve

H. SAFETY SHOWER

1. Haws Model 8907 wall-mounted

I. PRESSURE GAUGES

1. McDaniel Controls, Inc. 2-inch glycerin-filled, 0-100 psi, all stainless steel.

J. AIR COMPRESSOR

1. The air compressor shall be an Ingersoll-Rand type 30, Model 3C, 3 HP, horizontal type, size 60 RCVR with heavy-duty inlet filter/silencer and automatic condensate drain.

K. AIR CHECK VALVE

1. 1-inch Bronze air check valve, open at 10 psi.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All materials shall be installed in strict conformance with the manufacturer's instructions and recommendations.

B. All pipe, fittings, and valves within the building shall be properly anchored and/or supported and direction of flow indicated. Also separate colors will be used to identify power lines versus alum lines.

C. All pipes within vault will be labeled with description, i.e. alum suction line, alum discharge line, alum return line, water line, power line and direction of flow in large pre-printed labels.

D. All piping outside the vault shall have a continuous labeled metallic locating tape placed 12" above the line.

3.02 TESTING

A. All lines will be hydrostatically tested at 150 psi for two hours. No drop in pressure will be allowed.

END OF SECTION

SECTION 16000

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work included in Section 16 consists of furnishing all labor, materials, equipment and transportation and performing all testing and demonstration operations of all system features required for electrical work in accordance with these specifications and drawings which includes, but is not limited to the following:

1. Complete electrical wiring of all electrical distribution systems, lighting, including necessary feeders and connections to flow meters and other instrumentation and power loads as shown on the drawings and herein specified.

2. Mount and make all field connections to process instrument panels and other control panels furnished under other Divisions of these Specifications.

3. For process instrumentation furnish and install all conduit, wire, instrumentation cabling and interconnections between primary elements, transmitters, local indicators and receivers.

4. Electrical permits, fees, tests, inspection and guarantees.

5. Connection of all electrical equipment, including complete ground system.

6. Submit shop drawings.

7. Coordination of work with the Owner.

9. Provide record drawings.

1.02 PROPRIETARY NAMES

A. For convenience of description and as a standard for grade, type, quality, and performance characteristics, proprietary names are included with some descriptions. This does not imply preference to specific manufacturers (except where multiple choice is specified), but minimum requirements with approval to be made by the Engineer.

1.03 QUALITY ASSURANCE

A. Standards: All materials shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer that equipment meets or exceeds available stdards.

B. Codes: Install in accordance with latest edition of the National Electric Code and the regulations of governing local, State, County and other applicable codes, including the Utilities Company. Pay for all required licenses, fees and inspections.

C. Contract Documents: The drawings are generally diagrammatic; therefore, the Contractor shall make use of all the data in all of thecontract documents and shall verify all information at the site. During execution of the contract, the location of electrical apparatus shall be coordinated with the owner. All questionable locations shall be approved by owner or his representative prior to installation.

D. Inspections: During the course of construction, the work will be observed by the engineer. The Contractor shall call for inspections by the local building inspector during the normal phases of installation and, following each inspection phase, the engineer shall be furnished with Certificates of Inspection from all authorities having jurisdiction. After the completion of the work, the Contractor shall deliver all certifications or letters of approval from such bodies to the engineer. Following the successful completion of the final inspection, furnish the owner with a certificate of final approval.

E. Tests: The Contractor shall provide all necessary instruments and special apparatus to conduct any test that may be required to insure system performance and that control wiring and power cables are free of all improper grounds and short circuits. These tests shall be conducted in the presence of the owner's representative prior to final acceptance.

F. After service, feeders, and mechanical equipment feeder wires or cables are in place, but before being connected to devices and equipment, the system shall be tested for shorts, opens, intentional and unintentional grounds by means of an approved type of constant "megger". All wires in conduit that are shorted or unintentionally grounded shall be replaced.

G. With the system energized, line-to-line voltage and line current measurements shall be made under full load conditions. Should measured values deviate ± 10 % from the nameplate rating, the condition shall be corrected. Notify the engineer immediately should deviations occur.

H. The resistance between ground and absolute earth shall not exceed 25 ohms and shall be mesured by the Electrical Contractor before equipment is placed in operation. Testing shall be performed on all ground rod installations. Testing shall be three (3) point method in accordance with IEEE recommended practice.

I. Utility Company Fees, Charges, Costs:

1. It is the Contractor's responsibility to contact the required power utility company during bidding to determine if any fees, charges or costs will be due the utility company, as required by the utility company for temporary power, installations, hook-ups, etc. This fee, charge or cost shall be included in this Contractor's bid price.

1.04 SUBMITTAL

A. Shop Drawings:

1. Before submittal to the Engineer, all shop drawings shall be perused, corrected and verified by signature, or stamp and signature as approved by the applicable subcontractor to be in accordance with the requirements of the drawings and specification. Shop drawings that have not been signed or stamped and signed as approved, but have not been perused for compliance with the drawings and specifications and have not been

coordinated with other equipment and other trades, will be returned to the Contractor without being reviewed by the engineer. All component manufacturers' names shall be clearly visible on each submittal sheet. Dimensions, material lists, wiring diagrams, capacities, catalog numbers/cuts and other such pertinent data shall be submitted for approval of all equipment: disconnect switch, including circuit breakers, safety switches and controls; and all wiring and control devices. Approval of material will be based on the manufacturer's published ratings or on test results where specified. All data shall be submitted in a single package. No partial list will be reviewed.

2. If any required items are omitted from this submittal, the engineer shall select each such item indicating manufacturer, model, etc., and such decision shall be final. The term "Per Specifications" will not be acceptable. Samples shall be required as requested by the engineer to further substantiate any substitutions.

3. Any deviation from the specifications pertinent to shop drawings shall be listed separately and submitted with shop drawings. Failure to list all deviations in this manner shall be grounds for requiring removal of such items and installation of new items in exact accordance with specifications at no extra cost to the owner. No material shall be purchased or installed before written approval of any submission.

4. In addition to the shop drawings, which must be submitted for approval before ordering equipment, the Contractor shall furnish four copies of complete installation drawings, instruction books, maintenance manuals, and parts lists for each major item of electrical equipment, and similar data on minor items of equipment if requested by the engineer. This information must be submitted before the installation of the equipment.

B. Permits, Fees, Inspection Certificates and Tests

1. Permits: All required permits, fees and inspection certificates shall be obtained, paid for, and be made available by the Contractor during the progress of the work.

2. The Contractor shall perform or secure such tests as may be required, supplying all labor and instruments needed, or paying such costs as may be involved.

3. All tests required to establish the adequacy and quality of all systems shall be made by this Division in the presence of and to the satisfaction of the engineer.

4. All concealed work must remain uncovered until approved. All tests shall be made in strict accordance to code requirements. Defects disclosed by tests shall be made good and the defective materials replaced without additional cost to the owner. Tests shall be repeated after repairs or replacements have been made.

C. Record Drawings:

1. During the progress of the work, the job superintendent for this Division shall daily record on his complete field set of electrical drawings the exact location as installed of all underground and otherwise concealed conduits which were not installed exactly as shown on the contract drawings.

2. This work must be kept up-to-date and verified by the engineer's field representative before the payment is made. The complete marked set shall be delivered to the owner before the final acceptance of the work.

1.05 GUARANTEE

A. All equipment materials and workmanship shall be guaranteed to conform with the specifications and accepted alternates. Parts, defective or not in accordance with the specifications or accepted alternates, shall be replaced in the system and tested free of cost to the owner; and for a period of one year after final acceptance of the completed system, shall be fully guaranteed.

B. In the event that a repetition of any one material defect occurs, indicating the probability of repeated failures which can be traced to faulty manufacture, manufacturer's design of material or item, or Contractor's method of installation, the Contractor shall not continue to replace with the same material, part or method, but shall take steps to remedy the fault through replacement of all such defective material or revise completely the method of installation.

C. Manufacturer's guarantees, which extend beyond the guarantee period specified, shall be transferred to the owner before request for final payment.

D. All equipment, accessories and connections shall be guaranteed to operate without undue heating, noise or voltage drop; and the Contractor shall correct or adjust any items, should such conditions be found to exist after system has been put into operation. Whether or not a condition or noise is objectionable shall be decided by the engineer.

E. Certification must be provided stating that all materials and equipment used on the project are new.

1.06 SUPERVISION AND WORKMANSHIP

A. All work under this Division shall be performed under the immediate direction of fully qualified foremen. Insofar as possible and unless approved by the engineer, there shall be no change in supervision during the course of construction.

B. All workmanship shall be of the highest quality, and the right to require immediate removal from the project of any personnel for cause is reserved to the engineer.

C. It is the intent and of the essence of the specifications that all personnel furnished for this Division shall cooperate with all other personnel at all times to insure the furnishing of highest quality workmanship.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General: All electrical materials and equipment shall be new, of recent manufacture, shall bear the manufacturer's name, date of manufacture, trade mark and be approved by the Underwriters' Laboratories, Inc., except as otherwise specified herein. Material or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting with the approval of the engineer. All equipment shall be complete and in operating condition unless otherwise specified herein. Fusible equipment shall be equipped with fuses, an 100 percent of spare fuses of each type shall be supplied. Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elemens, but readily accessible for inspection.

B. Raceways:

1. PVC conduit shall be schedule 40 composed of High Impact PVC (polyvinyl) chloride (C-200 Compound), and shall conform to industry standards, and be UL listed in accordance with Article 347 of National Electrical Code for underground and exposed use. Materials must have tensile strength of 55 PSI, at 70 degrees F, flexural strength of 11,000 PSI, compression strength of 8600 PSI. Manufacturer shall have five years' extruding PVC experience.

2. RGS conduit shall be galvanized steel hot-dip inside and out, after threading and shall conform to Federal Specifications WW-C-581.

3. ALUM conduit shall contain less than 0.1 percent copper and conform to Federal Specification WW-C-540C.

4. PRGS conduit shall be PVC coated rigid steel conduit and fittings per Federal Specification WW-C-581E, ANSI Standard C80.1, UL Standard #6, 40 mils thick PVC coating and urethane interior coating as manufactured by Robroy Industries "PLASTI-BOND-RED.

C. Conductors:

1. All power conductors shall be copper Type XHHW cross linked polyethylene, 600 volts insulation, or approved equal. No. 10 and smaller may be single strand. No. 8 through No. 2 shall be 7 strand and No. 1 through 4/0 shall be 19 strand. 250 MCM through 500 MCM shall be 37 strand.

2. Connectors and lugs shall be Burndy series YA, YS YSV, applied with Burndy recommended tools. Taps in gutters shall be Burndy KSU, tin plated. All connectors shall be insulated with PVC tape and made watertight. Scotchlock insulated spring type connectors shall be used for fixture connections.

3. Pull compound, if used, shall conform to the recommendations of the wire manufacturer.

D. Panelboards

1. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

2. 120/240V, single phase, 3 wire, and 120/208V three phase, 4-wire panelboards shall be type NQOD, bolt-in branch breakers, NEMA 4X stainless steel enclosure as manufactured by the Square D Co., or equal.

3. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated.

4. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

5. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

6. A nameplate shall be provided listing panel type, number of circuit breakers, ratings and source.

7. Bus bars for the mains shall be of tin-plated copper. Full size neutral bars shall be included. Bus bar taps for panels with single pole circuit devices shall be arranged for sequence phasing of the branch circuit devises. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

8. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

9. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

E. Switches:

1. Wall switches shall be of the indicating, toggle action, flush mounting quiet type. All switches shall conform to Federal Specification W-S-896-D.

2. Wall switches shall be of the following types and manufacturer or equal. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary.

   a. Single pole - Arrow-Hart, Catalog No. 1991.

   b. Double pole - Arrow-Hart, Catalog No. 1992.

   c. Three way - Arrow-Hart, Catalog No. 1993.

d. Four way - Arrow-Hart, Catalog No. 1994.

e. Single pole, key operated - Arrow-Hart Catalog No.1l991-L.

f. Momentary contact, 2 circuit, center off - Arrow-Hart, Catalog No. 1895.

g. Weatherproof cover for Arrow-Hart 2900 series tap action switches; Arrow-Hart Catalog No. 2881-G.

F. Receptacles:

1. Wall receptacles shall be of the following types and manufacturer or equal.

a. Single, 20A, 125V, 1P, 3W; Arrow-Hart, Catalog No 5351.

b. Duplex, 20A, 125V, 2P, 3W; Arrow-Hart, Catalog No. 5352.

c. Weatherproof, 20A, 125V, 2P, 3W; Arrow-Hart, Catalog No. 5351 and WLRD-1 cover.

d. Corrosion-resistant, duplex, 20A, 1 25V, 2P, 3W; Arrow-Hart, Catalog No. 5351 and WLRD-I cover.

e. 60A, 480V, 3P, 2W; weatherproof receptacle shall be Crouse-Hinds Catalog No. ARE6324 with Crouse-Hinds Catalog No. APJ 6385 plug.

f. Ground fault interrupter, duplex, 20A, 125V, 3P, 2W; Arrow-Hart Catalog No. GF5342.

g. Stainless steel indoor mounting plate for G.F.I. receptacle; Arrow-Hart Catalog No. 97061.

h. Weatherproof cover for G.F.I. receptacle in FS box; Arrow-Hart Catalog No. 4501-FS.

i. Single, 20A, 125V, 2P, 3W; Arrow-Hart Catalog No. 8510BL; cover: Arrow-Hart Catalog No. 9301C indoor, 7420C weatherproof.

j. Single, 30A, 125V, 2P, 3W; Arrow-Hart Catalog No. 5716N; cover: Arrow-Hart Catalog No. 9301C indoor, 7420C weatherproof.

G. Device Plates:

1. Plates for flush mounted devices shall be of the required number of gangs for the application involved and shall be 302 (18-8) high nickel stainless steel of the same manufacturer as the device.

H. Nameplates: The following items shall be equipped with nameplates: All safety switches, motors and control panels. Special electrical systems shall be identified at junction and pull boxes, and equipment and cable racks. Nameplates shall adequately describe the function of the particular equipment involved. Nameplates for panel shall include the panel designation, voltage and phase of the supply. For

example, "Pump Control Panel, 480V, 3-phase, 3-wire". The name of the machine on the nameplates for a particular machine shall be the same as the one used on all motor starters and for that machine branch circuit breakers. Nameplates shall be laminated phenolic plastic, black front and back with white core, with lettering etched through the outer covering. White engraved letters on black background. Attach with plated self-tapping screws or brass bolts.

I. Boxes : All outlet and switch boxes and fittings used throughout the job, except where electric metallic tubing is permitted, shall be plastic, FRP or stainless steel. Boxes shall be minimum size as required by the National Electric Code and large enough to permit a satisfactory installation of the required conductors. Extra large boxes shall be used in accordance with the NEC where necessary to prevent undue crowding of wires. Cast type gang boxes shall be used for gang switches and to provide additional conductor space.

J. Ground Rod: Ground rods shall be a copper clad steel rod 5/8 inch diameter by 20 feet long, approved for that use.

K. Lightning Arrestors: Secondary lightning protection shall be provided on each phase on the line side of main service as shown on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATIONS

A. All work shall be executed in a neat and workmanlike manner by experienced and capable electricians so as to present a neat installation upon completion. Electrical work shall be coordinated so as not to interfere with other construction operations. All work under each section of this Division shall be laid out and installed in advance of pouring concrete floors or walls.

B. The Contractor shall perform or be responsible for all necessary cutting, sleeving, excavating and backfilling and compacting for the installation of the equipment and the patching thereafter. Metal conduits installed underground or in concrete slabs shall be coated with two coats of asphalt paints.

C. The Contractor shall furnish and install all inserts, and hangers required to support conduit, cables, pull boxes, etc. The Contractor shall furnish and install all sleeves or openings through floors or walls required for passage of all conduits or ducts installed. Sleeves shall be of 18 gauge galvanized sheet steel rigidly supported and suitably packed to prevent ingress of wet concrete. If sleeves, hangers, inserts, etc., are improperly installed, all necessary cutting and patching to rectify such error shall be performed.

D. The Contractor shall permanently and effectively ground service neutral and all raceways, devices, and utilization equipment in accordance with requirements of National Electrical code, and as shown or required. All grounding electrodes shall have rigid clamp jaws.

E. The Contractor shall install control devices furnished by equipment manufacturers with their equipment and complete the wiring in accordance with manufacturer's recommendations and approved wiring diagrams.

F. Feeders and Branch Circuitry: Sizing of main feeders and branch feeders is fully delineated on the drawings. The Contractor shall provide all feeders in accordance with the indications of the drawings and shall connect them for correct phase sequence and the proper operation of the equipment they serve.

G. Conductors: Conductors pulled in raceways shall be greased to reduce strains on the conductor and on the insulation. Conductors that are nicked or scarred during installation shall be removed. The raceways will be cleaned and freed from any burrs or abrasions and new conductors installed. Conductors shall be laced and trained in all panelboards, control panels and terminal cabinets. Color coding of conductors is mandatory. The phase conductors of all feeder circuits and the control conductors of all control circuits shall be grouped as such, laced and identified where installed in the pull boxes.

H. Grounding:

1. In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated or bare copper system grounding conductor in accordance with specific rules of Article 250 of the NEC. Bonding conductor through the raceway system shall be continuous from main panel grounding bar to branch circuit equipment and devices.

2. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground, be installed in metal conduit with both conductor and conduit bonded at each end, have connections accessible for inspection and made with approved solderless connectors brazed (or bolted) to the equipment or structure to be grounded, in NO case be a current carrying conductor, have green jacket unless it is bare copper, be run in conduit with power and branch circuit conductors. The main grounding electrode conductor shall be exothermically welded to ground rods.

3. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal to metal contact.

4. Mechanical lugs or wire terminals shall be used to bond ground wires together or to junction boxes and panel cabinets and shall be manufactured by Anderson, Buchanan, Thomas and Betts Co., or Burndy.

5. All exterior grade mounted equipment shall have their enclosures grounded directly to a separate driven ground at the equipment.

6. All raceways shall have an insulated copper system ground conductor throughout the entire length of circuit installed within conduit in strict accordance with NEC. Grounding conductor shall be included in total conduit fill determining conduit sizes, even though not included or shown on drawings. Grounding conductors run with feeders shall be bare only.

I. Raceways:

1. General: Conduits shall be installed to insure against the collection of trapped condensation, and all runs shall be arranged so as to be devoid of all traps wherever possible. Precautions shall be taken to prevent the lodging of dirt, plaster or trash in conduit, tubing, fittings and boxes during the course of construction. A run that has been or becomes clogged shall be entirely cleared or replaced. All metallic conduit installed in concrete or below grade shall be painted with two coats of black asphalt paint. Where conduits leave or enter a slab, a flush coupling shall be installed.

2. Size: Minimum size for all conduit is 3/4 inch.

3. Rigid Steel Conduit: Rigid conduit shall be securely fastened to all enclosures, care being taken to see that the full number of threads project into the hub. All field cut threads shall be coated with a zinc compound.

4. Flexible Conduit: All generator equipment and motors, where indicated, shall be connected with vapor tight flexible metallic conduit of the size required for the conductors to the equipment. Bonding shall be in accordance with local codes.

J. Devices: Devices shall be set plumb with the footing or floor and at locations indicated. Where devices must be moved because of conflict, approval of the engineer shall be obtained prior to relocation.

K. Electrical Work Required for the Installation of Equipment Under Other Divisions of these Specifications: The Contractor shall provide all conduit, conductors, boxes, safety switches, and all necessary hardware required for the installation of equipment.

L. Electrical Service: Electrical service shall be in accordance with the rules and regulations of the local utility, and the Contractor shall provide the following:

1. The Contractor shall furnish all labor, materials, etc., necessary for a complete approved electrical service as required for this project, including inspection and approval by the utility and local inspection departments (if any), and inform the engineer prior to energizing power lines. This Contractor shall notify the utility company in writing, with two copies to the engineer, not later than ten (10) days after signing contracts as to when this Contractor anticipates the service will be required.

2. Furnish and install a 120/240 volt, 3-phase, 4-wire a service from power company transformers to main service equipment where shown on the plans. Seal conduits where entering hazardous areas. The underground service shall comply with all the requirements of the NEC, local utility company and local enforcing authority.

3. Metering: Meter base shall be furnished and installed by this Contractor. Metering base and conduit must be installed in accordance with the utility company requirements.

END OF SECTION